the OIL AND GAS JOURNAL

AUGUST 13, 1956

PRODUCTION . . .

"Graybeard" Oil Field Still A Model

First unitized field, Van in Texas, isn't acting its 27 years.

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EQUIPMENT . . .

Oil-Country Steel Goes Up $9.50 to $21.75 per Ton

Mills roll again. Prices are up, and shortage may extend for a year.

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REFINING . . .

How First Rexformer Is Performing

Aurora plant at Detroit is charging 5,500 bbl. per day of fresh feed.

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DRILLING . . .

Faster Hole With New Oil Emulsion

Drill cuttings larger than those taken when drilling with water.

p. 110

Despite roadblocks, Trans-Canada Line will be finished p. 78

SAFETY

Is Under The Hat

Steel-toed shoes and a safety hat protect the one who wears them. But a program designed to prevent accidents will develop what's **under** the hat. After 33 years of intensive training, safety has become a habit with your Halliburton operator. It marks the manner in which he works, stamps the design of his tools and equipment, shapes him for top at-your-rig service. Last year, for example, he drove ninety million miles with an accident ratio of only .36 per hundred thousand . . . approximately one accident per three hundred thousand miles. This "under the hat" kind of safety is another good reason to choose Halliburton as one source for all six coordinated well completion services.

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CHEMICAL SERVICES

CEMENTING EQUIPMENT

A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

Most new superpremium motor fuels may not have the high octane ratings that advertising agents would lead you to believe. Five laboratory tests on three competing brands recently introduced in Houston showed only two batches ranging above 100 octane. In these five tests, octane ratings reportedly ranged from 99.2 to 102.

Double-jointing of line pipe in the yard is really paying off for a big-inch spread in Ohio.

By doubling 30-ft. joints into 60-ft. lengths the spread has increased its daily pipe laying 20 per cent. Even in hill country, normal spread output using the double joints has been raised to about 8,500 ft. per day. Cost per mile also has been cut, although not as much as spread output has increased. The reason: added costs involved in double jointing.

Refiners considering the jet-fuel market for commercial planes had better think about thermal stability of their product.

While the full jet commercial craft now planned will not operate at supersonic speeds, they will utilize the fuel supply to cool some components. Hence high-temperature stability will become a requirement for future commercial jet fuels as well as the military fuels now in use. This means more careful selection of stocks and probably some hydrogen treating. The airlines, which are ordering jet planes at an increasing clip, have not yet made up their minds whether to buy the JP-4 military-type fuel or a kerosine-type fuel. But those in the know believe that they will lean toward kerosine or kerosine blends. The next few months should reveal further leads on this trend.

Better drilling performance of the rotary bit is still a major objective of tool manufacturers despite claims that peak efficiency is rapidly being reached with present drilling methods.

Though present bits use the best metals available and the fluid stream operates at maximum efficiency to keep cutters clean, many people feel that new designs might speed drilling and thereby cut costs.

One area where possible new designs would help is in formations too hard for regular hard-rock bits yet too soft for the expensive carbide-insert bit. Needed is a new bit which would cost less than the button bit but which would drill as fast or faster.

Demand for Esso's superpremium third grade is holding up well enough to keep the refineries humping to make the 100 plus octane product.

Installation of the third pump has spread from the five test cities to include nearly 2,500 stations throughout the company's marketing area. About one-third of Esso's stations are large-volume outlets which handle 75 per cent of its total sales. Most of these will be equipped with the new grade well before Labor Day.

Operators in Colombia must soon start exploring all their concessions or give them up. The government issued a decree 2 months ago aimed at companies which have shown no inclination to get under way. The reported deadline is September. Either way—whether present concession holders act quickly or new companies are invited in—the government figures to get the increased exploration it is seeking.

The OIL AND GAS JOURNAL

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TECHNOLOGY—OPERATION

Refining-Processing

First Rexformer Now on Stream **106**

Aurora Gasoline Co. has placed the first Rexformer on stream at its Detroit refinery. Unit makes 102 octane gasoline product; takes 5,500 bbl. per day fresh feed; has 1,500 bbl. per day recycle.

Are Diesel Fuels Better Than Necessary? **113**

By G. L. Farrar

Diesel fuels now being marketed throughout the U. S. are better than they need be: (1) cetane number is higher than required; (2) end point is lower than necessary; and (3) other specifications are too stringent.

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By J. S. Clarke

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By R. M. Ringoen

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By Norman S. Morrisey

Over-all performance on a Carter hole in southern Oklahoma was highly satisfactory. One bit stayed on bottom 201¼ hours. Much rig time was saved.

New Oil Emulsion Speeds West Texas Drilling **110**

By Ed McGhee

A new oil-water emulsion has been making hole in West Texas as fast as water alone. Contractors report that they get longer bit life, and thus faster drilling and lower costs.

Field Processing—18: Back-Pressure Control **116**

By John M. Campbell

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By D. H. Stormont

Diluents are offering invaluable aid at hundreds of rod-pumped wells in several California low-gravity oil fields.

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Electronic Computers Aid Geophysical Interpreters **136**

By E. G. Kogbetliantz

New geophysical possibilities are available with the introduction of modern electronic computers. These machines greatly increase the number of computations it is feasible to make.

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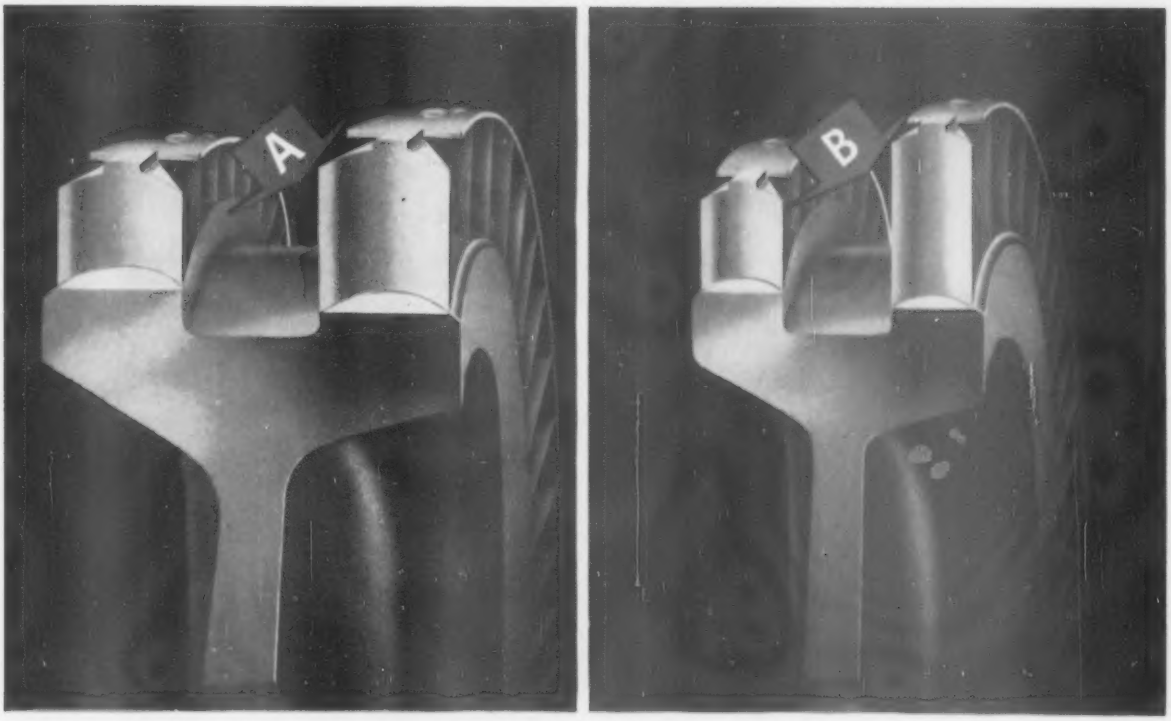

(Left, A) wide bucket "L" type wheel. (Right, B) regular type wheel for Coppus Steam Turbines

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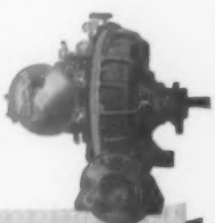

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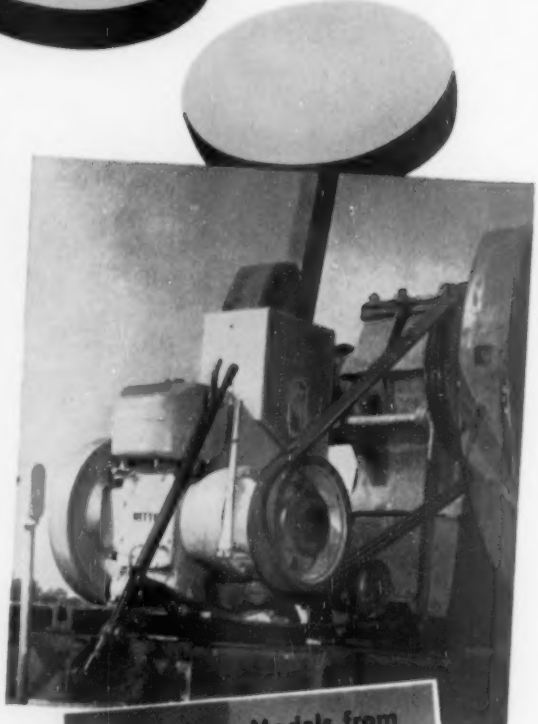

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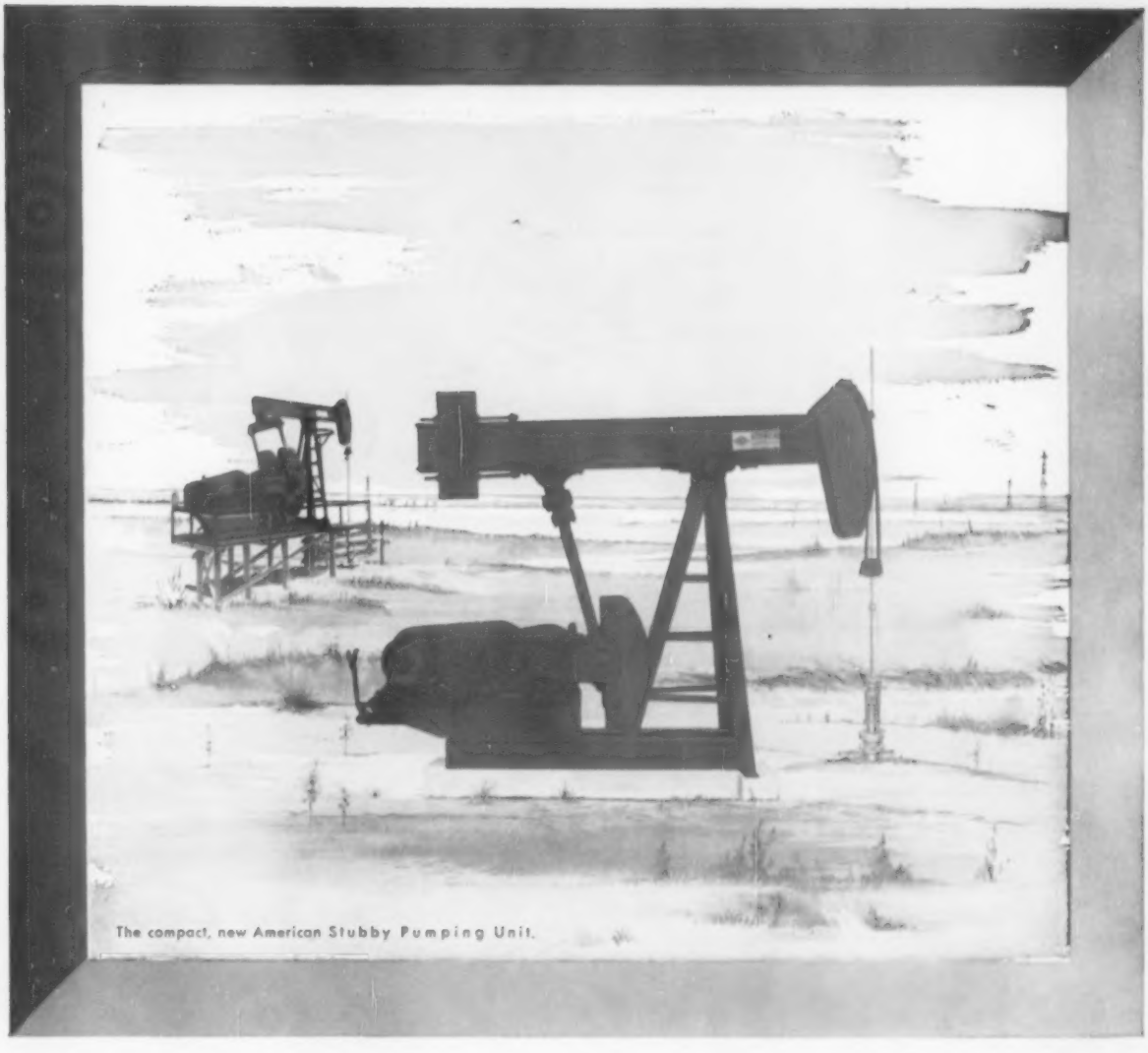

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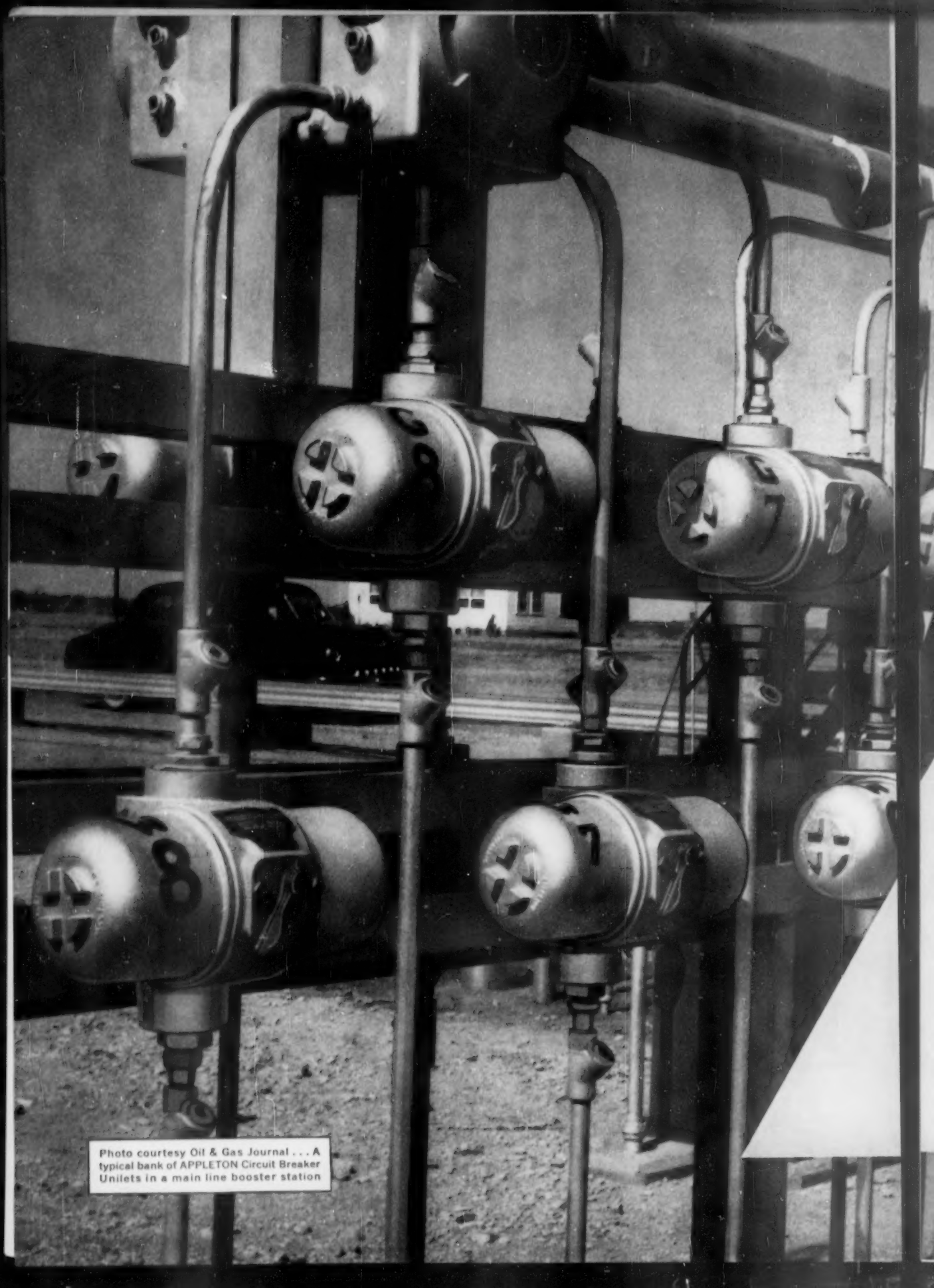
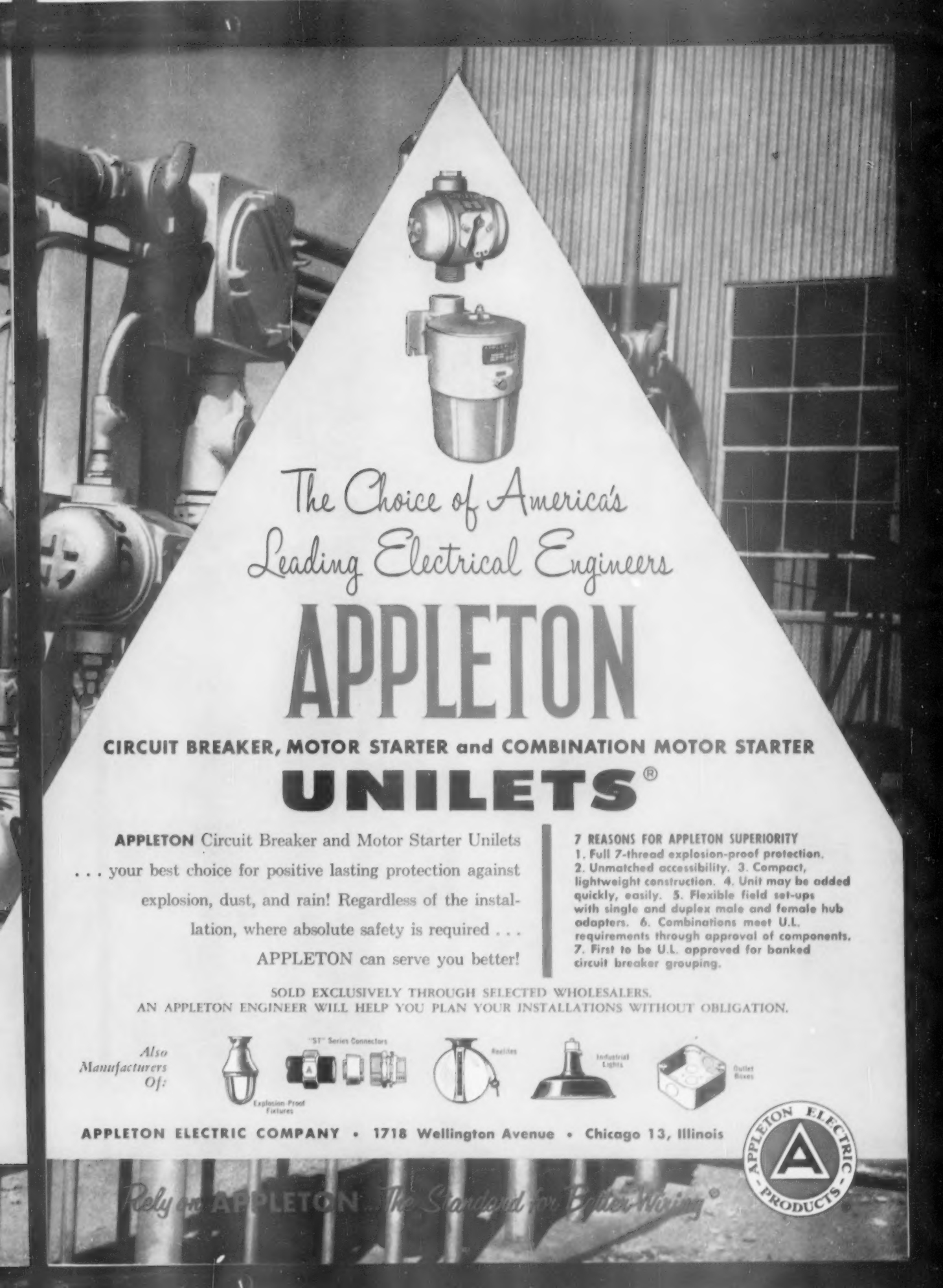


Photo courtesy Oil & Gas Journal . . . A typical bank of APPLETON Circuit Breaker Unilets in a main line booster station



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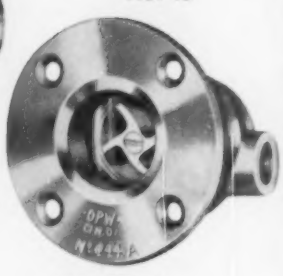

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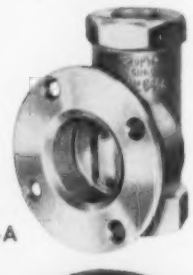

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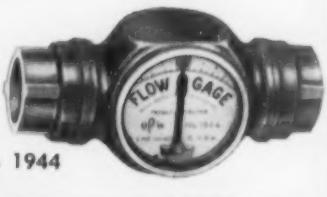

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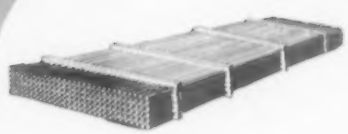

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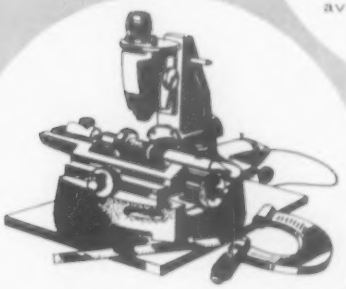

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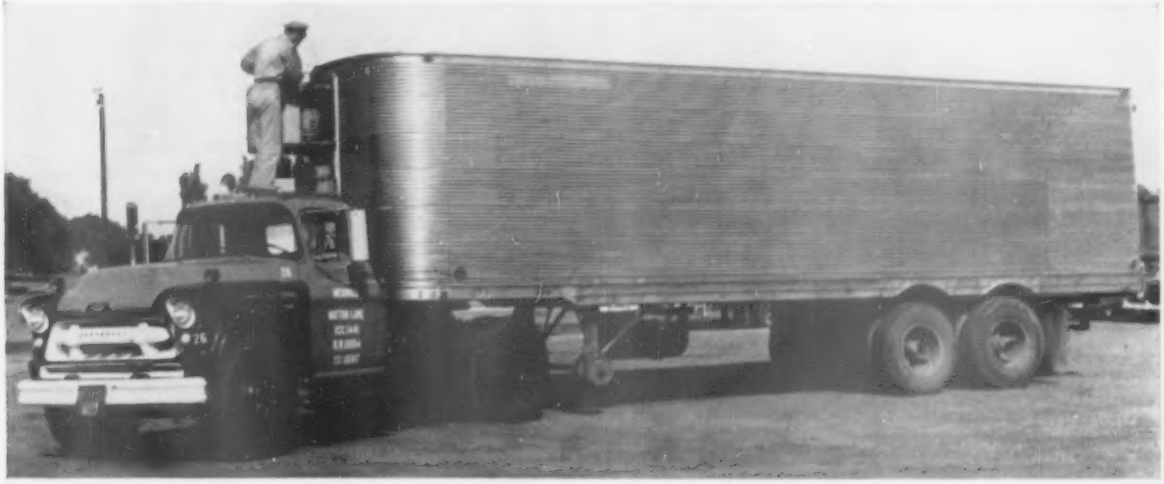
NEW HEAVYWEIGHT CHAMPS!



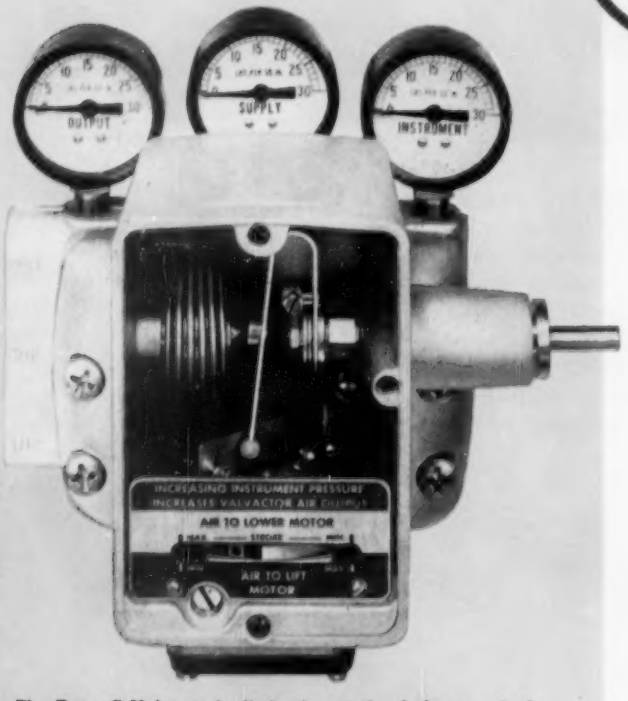
TASK·FORCE TRUCKS

old-fashioned truck!

NEW!

MOST UNIVERSALLY ADAPTABLE VALVE POSITIONER ON THE MARKET!

...the Foxboro Type C VERNIER VALVACTOR*



The Type C Valvactor's distinctive motion-balance principle of stem positioning eliminates loading effects of heavy fixed-stroke actuating springs. Note compactness — the simplest mechanical design of any valve positioner.

**Trademark of a precision valve positioner made by The Foxboro Co.*

Unique Flexibility Easily reversible in seconds. Sequencing by two simple adjustments.

Super Response Full air-pressure output to diaphragm motor on signal air-pressure change as small as ½ of 1% of signal span.

Extra Speed New, high capacity relay provides high speed positioning action.

Positive Positioning Direct, motion-balance feed-back assures instantaneous, pin-point positioning.

Now there's a positive-action, super-precision valve positioner that you can easily adapt to *any* diaphragm motor application — without exchange of parts! It's the Foxboro Type C Vernier Valvactor with unique motion-feedback.

The Type C Valvactor has a master setting disc which provides easy change of action as required by the control system, as well as easy reversal of Valvactor action for air-to-open or air-to-close control valves. Adjusting for limited stem travel is equally simple ... sequencing of several valves is a cinch!

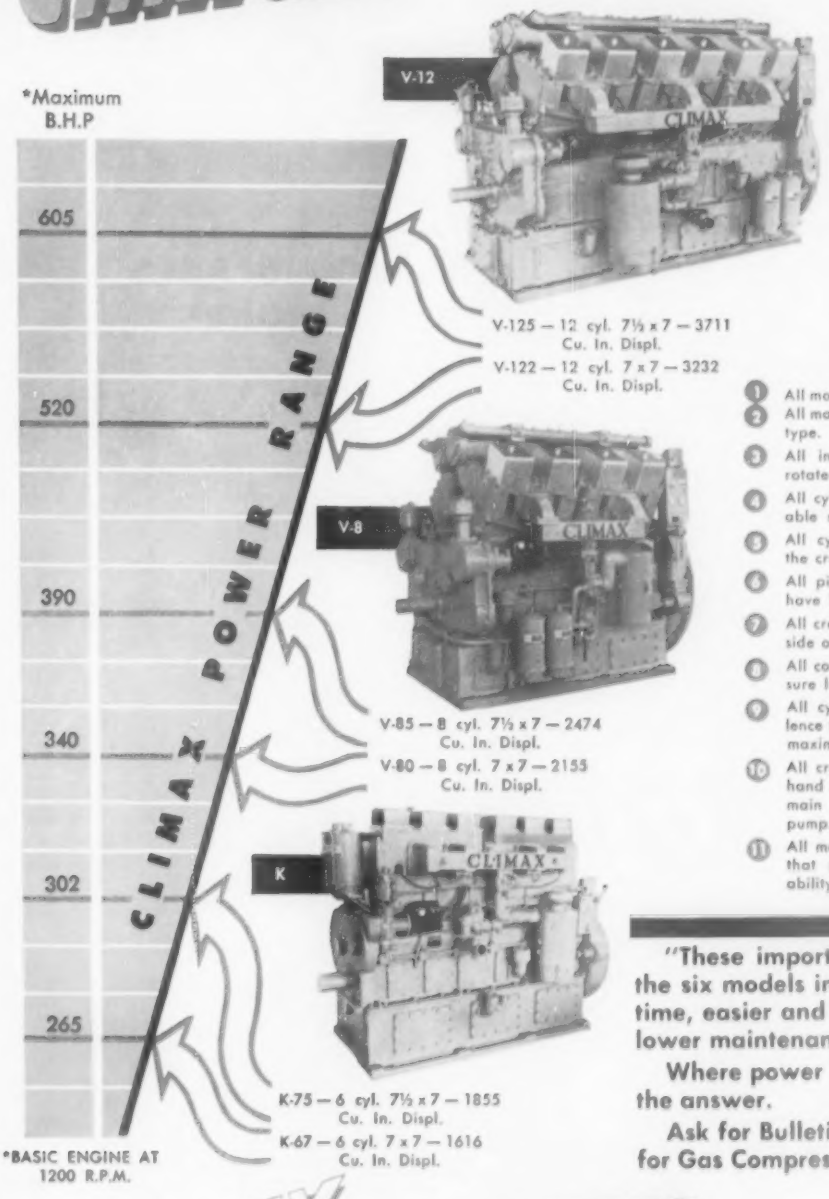
The Valvactor is the ideal solution to such problems as stem friction, plug friction, valve motor and transmission line lag, and extreme process line pressure changes. And it requires practically no maintenance! Available with 3-gauge and by-pass manifold, or plain manifold. Write for full details.

The Foxboro Company. 608 Neponset Ave., Foxboro, Mass., U.S.A.

FOXBORO
REG. U.S. PAT. OFF.

VALVE POSITIONERS

climax Blue Streak Engines


*Maximum B.H.P
605
520
390
340
302
265
CLIMAX POWER RANGE
V-12
V-125 — 12 cyl. 7½ x 7 — 3711 Cu. In. Displ.
V-122 — 12 cyl. 7 x 7 — 3232 Cu. In. Displ.
V-8
V-85 — 8 cyl. 7½ x 7 — 2474 Cu. In. Displ.
V-80 — 8 cyl. 7 x 7 — 2155 Cu. In. Displ.
K
K-75 — 6 cyl. 7½ x 7 — 1855 Cu. In. Displ.
K-67 — 6 cyl. 7 x 7 — 1616 Cu. In. Displ.
*BASIC ENGINE AT 1200 R.P.M.

OFFER THE BIGGEST VALUE IN THE ENGINE INDUSTRY

1. All models have 7" stroke.
2. All main and rod bearings are the precision type.
3. All intake and exhaust valves are free-to-rotate type.
4. All cylinder blocks are provided with renewable sleeves.
5. All cylinder blocks are cast separate from the crankcase.
6. All pistons are aluminum, cam ground, and have five rings.
7. All crankshafts have a main bearing on each side of each crankthrow.
8. All connecting rods are rifle drilled for pressure lubrication of piston pins.
9. All cylinder heads have Climax high turbulence type combustion chambers which produce maximum fuel economy.
10. All crankcases and engine bases have large hand holes on each side for easy access to main and connecting rod bearings and oil pump.
11. All models have the Climax consistent design that makes possible maximum interchangeability of wearing parts.

"These important features applying to the six models indicated, mean less down time, easier and faster field servicing and lower maintenance costs.

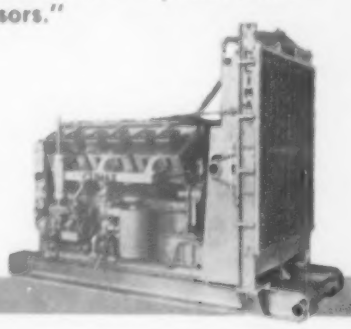
Where power is your problem Climax is the answer.

Ask for Bulletin SA-611 — "Special Units for Gas Compressors."

climax

BLUE STREAK ENGINES

CLIMAX ENGINE AND PUMP MFG. CO.
208 SO. LA SALLE ST. CHICAGO 4, ILL.
FACTORY CLINTON, IOWA • DISTRICT OFFICE 155 CONTINENTAL AVE. DALLAS 7, TEXAS



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Williston, N. Dakota

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Tobin Machinery Co.
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•

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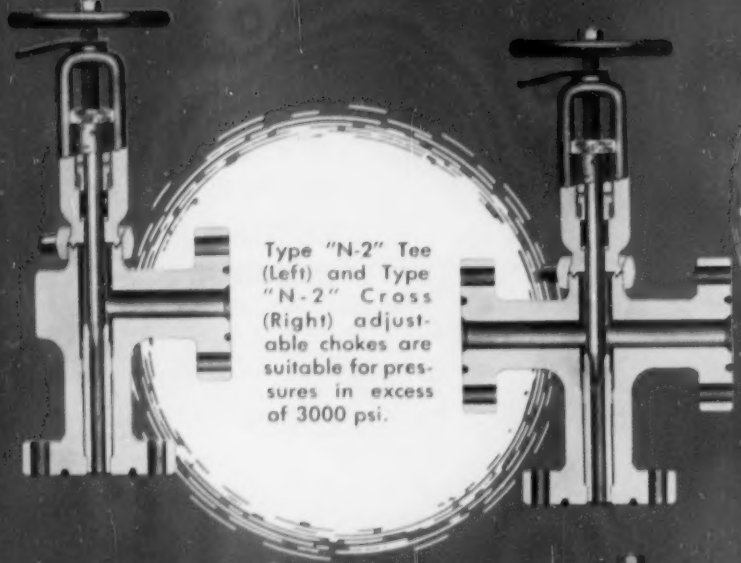
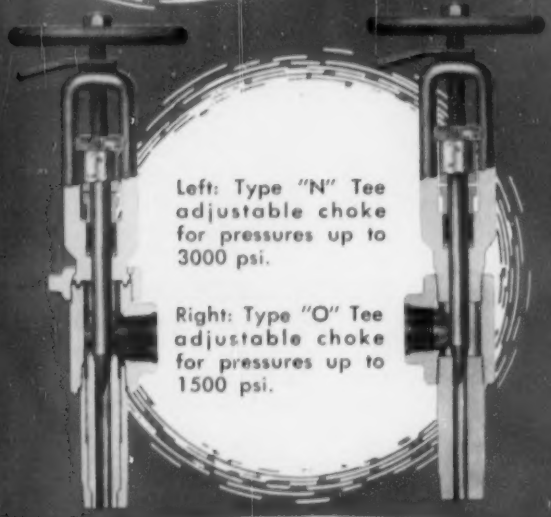
O·C·T offers a complete

ADJUSTABLE CHOKES

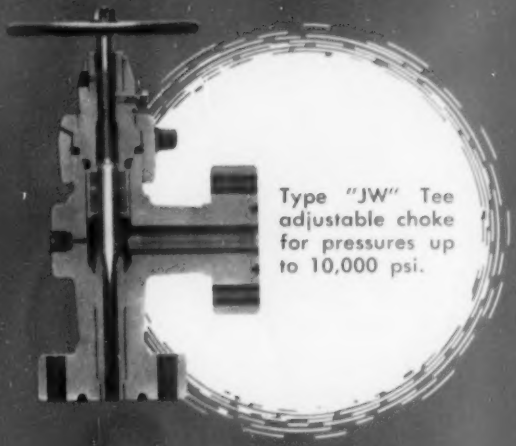


Type "N-2" Tee (Left) and Type "N-2" Cross (Right) adjustable chokes are suitable for pressures in excess of 3000 psi.



Left: Type "N" Tee adjustable choke for pressures up to 3000 psi.

Right: Type "O" Tee adjustable choke for pressures up to 1500 psi.



Type "JW" Tee adjustable choke for pressures up to 10,000 psi.

ALL SIZES

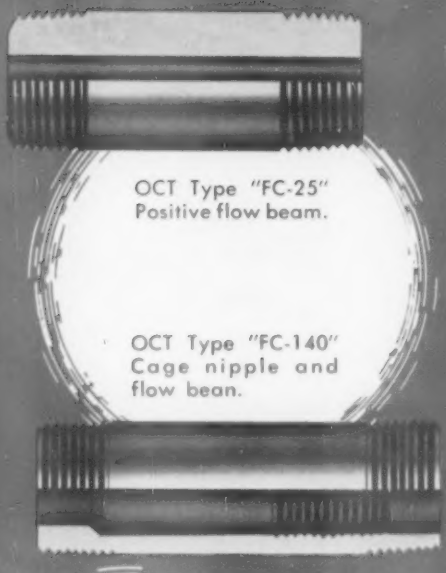
0.0273"

to 2¼"

ALL PRESSURE RATINGS

1,500 psi to 30,000 psi

line of chokes...and every one is the best of its kind!

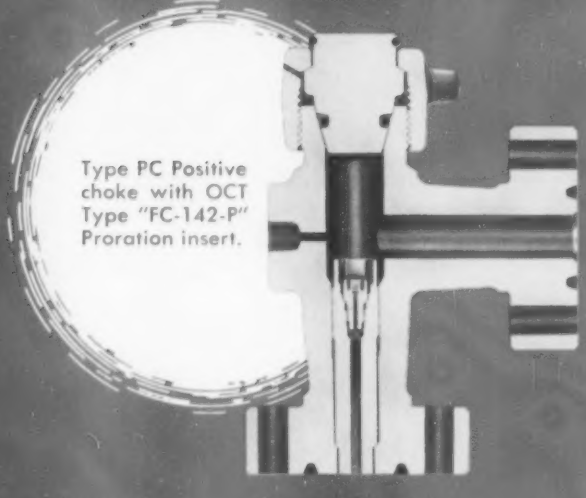


OCT Type "FC-25" Positive flow beam.

OCT Type "FC-140" Cage nipple and flow bean.

POSITIVE CHOKES

OCT makes a complete line of cross and tee choke fittings in all popular sizes and all pressure ratings, as well as a complete line of cage nipples, flow beans, and proration inserts. Most choke fittings will accommodate either positive flow beans or adjustable choke assemblies. This interchangeability reduces the inventory of parts required to service wells in a given field.



Type PC Positive choke with OCT Type "FC-142-P" Proration insert.

OCT Type "FC-142-P" Proration insert.

ALL parts of OCT Chokes are carefully made of materials best suited to the requirements of the well. Precision machining assures maximum safety as well as interchangeability of parts.

ALL MATERIALS

OCT Chokes are made in a complete range of materials from special analysis steel for general duty to tungsten carbide, monel or stainless steel for "problem" applications.

O·C·T

OIL CENTER TOOL CO.

P. O. Box 3091, Houston, Texas

Export Representatives: Sterling Areas – Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. South America—East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

CREATIVE BANKING

and the stopped pumps

Creative banking represents more than an interest in your problem. It begins with a detailed knowledge of current conditions, such as lower allowables, stopped pumps. And from this knowledge of the oilman's problems, the ground work to help is laid.

Creative banking works for you. Creative banking means financing flexible enough to help you when help is needed; flexible enough to meet changing conditions as they arise. It means no hard and fast rules to hamper sound financial planning and assistance. Creative banking at The National Bank of Commerce gives you the financial help you need rather than imposing a financial burden.

The experience and resources of The National Bank of Commerce of Houston are now being used in Wyoming, Colorado, New Mexico, Texas, Louisiana, and Mississippi.

E. O. Buck, *Vice President, Oil Loan Department.*

THE NATIONAL BANK OF

COMMERCE

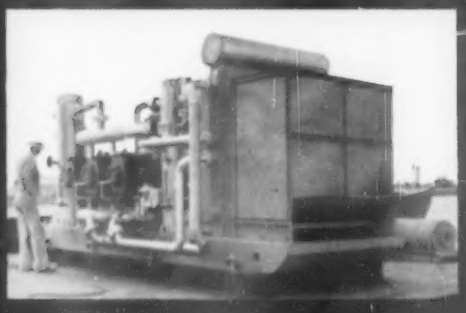
OF HOUSTON *Gulf Building — 712 Main Street, Houston, Texas*

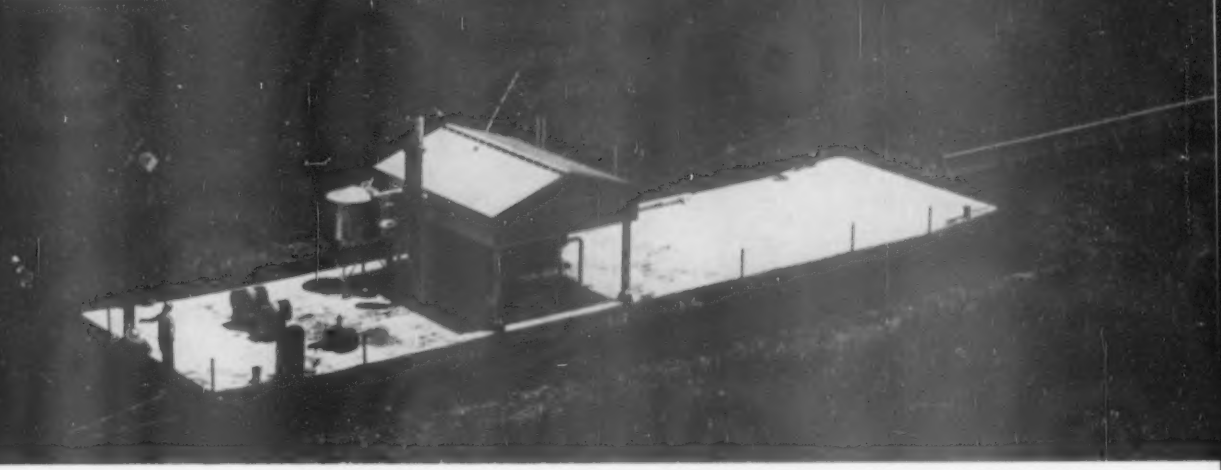
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

BEAIRD-INGERSOLL-RAND

Packaged Compressor Plant

Lowest Cost Per Horsepower Installed





GULF REFINING COMPANY BAYOU COUBA FIELD COMPRESSOR STATION—equipped with a Beaird-Ingersoll-Rand 165 h.p. 6 JVG four cycle gas engine driven compressor, Young radiator with lubricating oil cooler and gas coolers, and all necessary controls for unattended operation. Other sizes 110 to 660 h.p.

Packaged Compressor for —

BARGE MOUNTED GAS LIFT SERVICE

Gulf Refining Company has installed this barge mounted compressor station in Bayou Couba Field, Louisiana. Part of a 21-well gas lift operation, the 165 h.p. 6 JVG Beaird-Ingersoll-Rand packaged unit was added to supplement three high gas-oil ratio wells formerly used to produce the field. Picking up from the lifted wells at 50 psig., the compressor boosts the gas into the injection system at 825 psig. where it is joined with make-up gas drawn from the high ratio wells. By using a closed gas lift system Gulf has stopped flare gas losses and extended the life of the high gas-oil ratio wells.

Completely packaged and on its own skid base, the unit was installed on a conventional cargo barge. Piping and plant layout has been designed to facilitate the economical addition of a second compressor to the station when required.

Fully automatic in operation, the compressor is equipped with speed and pressure regulators which permit it to swing with changes in line pressure by varying the engine speed through a range of 50% to 100%. Other controls watch over the unit day and night ready to shut it down should any unusual operating condition occur. Only routine scheduled inspection and maintenance is required for 24-hour unattended operation.

Let us tell you about the economy of using Beaird-Ingersoll-Rand packaged compressor plants for offshore and tidelands production.

MACHINING
MANUFACTURING
STEEL WAREHOUSE

BEAIRD

THE J. B. BEAIRD COMPANY, INC.

PACKAGED COMPRESSOR PLANTS

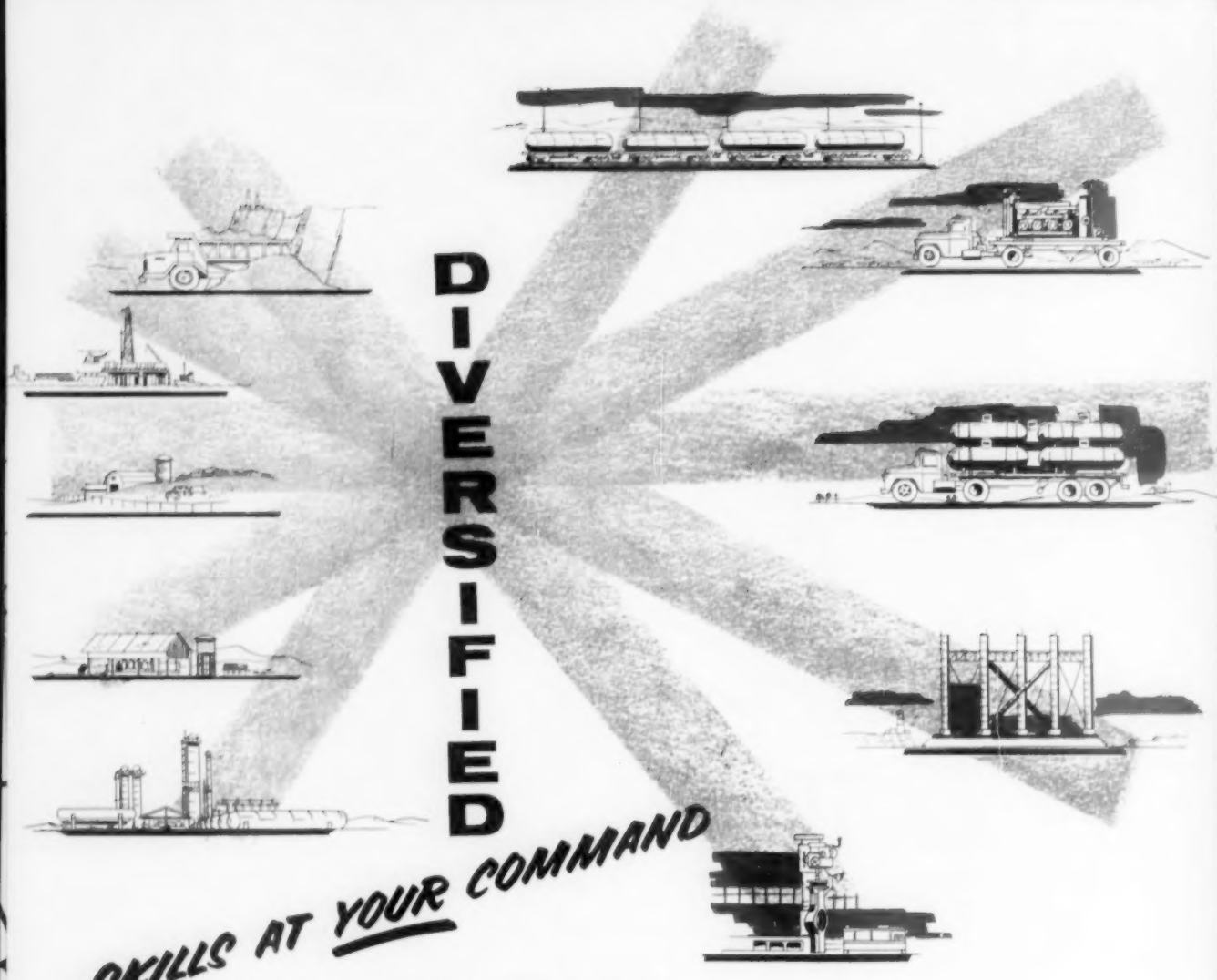
CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

SHREVEPORT, LOUISIANA • Sales Offices: *Dallas, Houston, Corpus Christi and Midland, Texas • New Orleans, Louisiana • Tulsa, Oklahoma • Denver, Colorado • Los Angeles, California, and Cie. Ingersoll-Rand, Paris, France*



...SKILLS AT YOUR COMMAND

King Sized storage vessels for a refinery in Mexico — packaged compressors for a Texas gas field — LP-Gas systems for farm homes in Minnesota — legs of steel for offshore drilling rigs — axles for strip-mining mammoths in Montana.

In these Beaird-built products are combined the creative talent and manufacturing dependability that have created a highly diversified source of production. With five manufacturing divisions, Beaird offers its customers the benefits of the integrated facilities and experience of the entire production team.

This reserve of tools and skills at Beaird is at your command.

Why not check with Beaird on your next equipment requirement or for outside machining and fabricating service.

BEAIRD

COMPRESSOR DIVISION, INCLUDING PLANT STORAGE • L P-GAS AND ANHYDROUS AMMONIA EQUIPMENT DIVISION • SPECIAL PRODUCTS DIVISION • MACHINE PRODUCTS DIVISION • STEEL WAREHOUSE

THE J. B. BEAIRD COMPANY, INC.
SHREVEPORT, LOUISIANA
STOCKTON, CALIFORNIA
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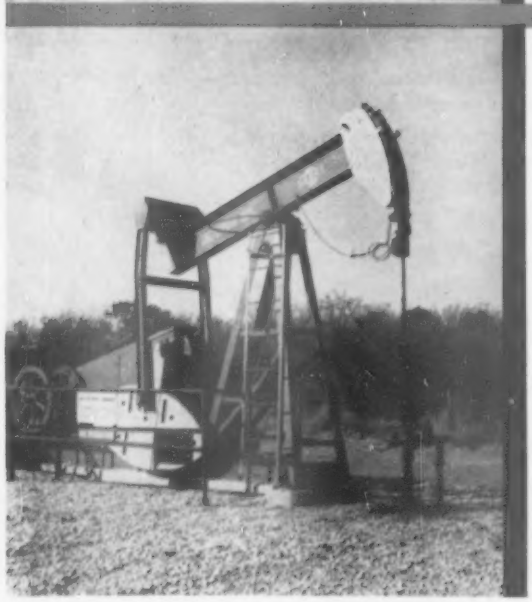
SUPPLY *can give your oil a real*

LIFT!



J&L Supply men from the Gulf of Mexico into Canada and from the Rocky Mountains east keep a vigilant eye on producing wells. This has been going on for over fifty years.

Cabot units expertly engineered to fit your wells put J&L men on your team. They never lose interest. Field service shops in the United States and Canada never close.

For the best in pumping units—for immediate service—for seasoned advice, call your local J&L Supply store today! You will find it listed in the yellow pages of your phone book.

CABOT ADJUSTABLE-CRANK Series structure capacities are from 9,000 to 32,000 pounds maximum polish rod load. The flood lubricated Sykes-cut herringbone gears are rated (API) from 40,000 to 456,000 inch-pounds. ILLUSTRATED HERE: Upper right, AC15-114D, polish rod 15,000; peak torque 114,000. Upper left, AC13-114D, polish rod 13,000; peak torque 114,000. Lower left, AC9-40D, polish rod 9,000; peak torque 40,000.

Jones & Laughlin

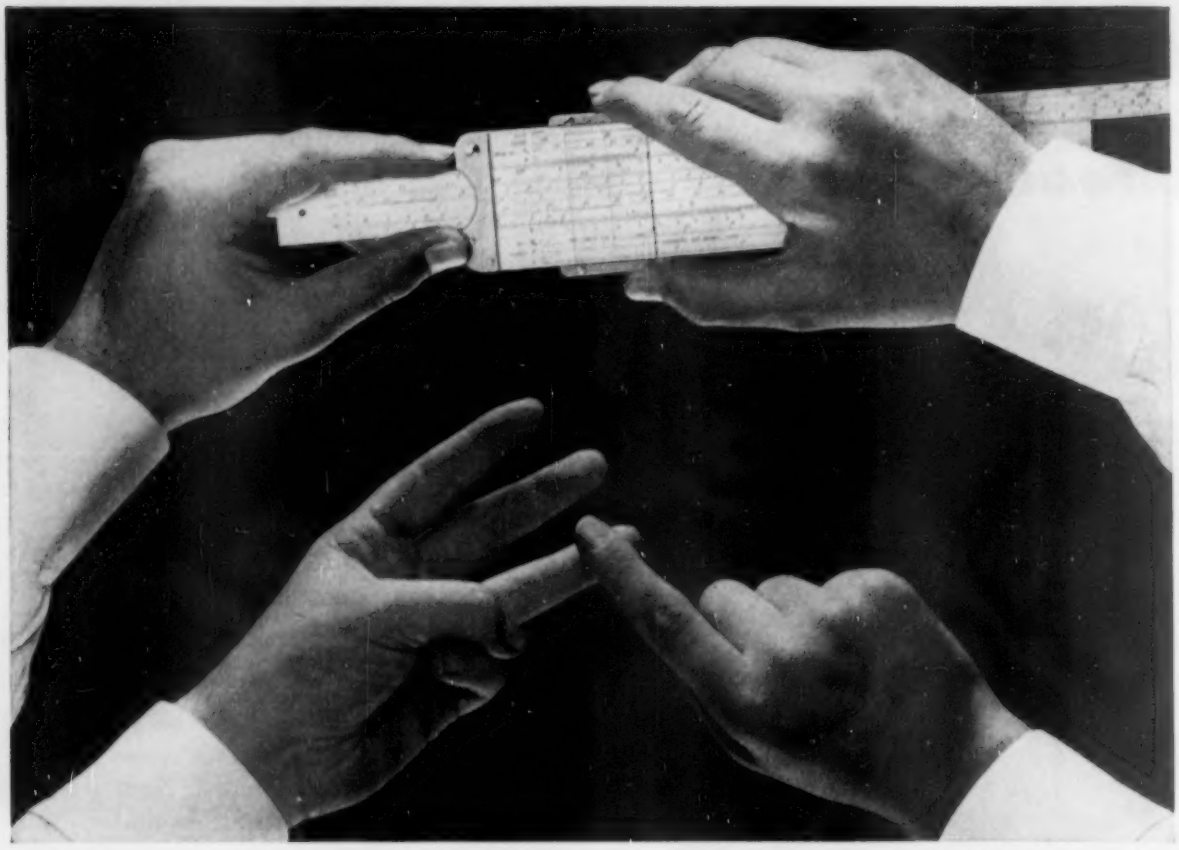
SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

12M

Any way you figure it . . .

DOW



GALVOMAG anodes are your best buy

25% more current output. GALVOMAG high-potential anodes generate more current—assure protection in high-resistivity soils.

Whether you use an engineer's slide rule or count on your fingers, GALVOMAG* high-potential anodes give you more cathodic protection for your dollar. Take our word for it, or do the mathematics yourself. Either way you get an answer that means less cost with GALVOMAG anodes.

Take high-resistivity soils. GALVOMAG anodes have 25% higher potential than ordinary anodes—give you that extra punch you need without installing extra anodes.

Take average soils. 4 GALVOMAG anodes will do the work of 5 ordinary anodes. Fewer holes are needed so you save 20% on installation costs.

Your Dow anode distributor can translate the advantages of GALVOMAG anodes into dollar and cents savings for your specific application. Call him today. THE DOW CHEMICAL COMPANY, Dept. MA 378Q, Midland, Michigan.

*Trademark of The Dow Chemical Company

CALL THE DISTRIBUTOR NEAREST YOU: CATHODIC PROTECTION SERVICE, Houston, Texas • CORROSION SERVICES, INC., Tulsa, Oklahoma • ELECTRO RUST-PROOFING CORP. (Service Division), Belleville, N.J. • ETS-HOKIN & GALVAN, San Francisco, Calif. • ROYSTON LABORATORIES, INC., Blawnox, Penna. • STUART STEEL PROTECTION CORP., Plainfield, N.J. • THE VANODE CO., Pasadena, Calif.

you can depend on DOW MAGNESIUM ANODES DOW

Thirty-foot lengths of 2-inch, Schedule 40 National PVC Plastic Pipe. Each of these easy-to-handle lengths actually weighs less than 20 pounds.

2,800 feet of

USS NATIONAL* PVC PLASTIC PIPE

laid in 1¾ hours

The TXL Oil Corporation is putting National Polyvinyl Chloride Plastic Pipe to its first rough oil field test—as a gathering line subject to paraffin deposits. A pipe laying crew made the installation in the Permian Basin, 12 miles south of Odessa, Texas, laying the 2,800-foot line in less than an hour and 45 minutes.

Normal impact, two-inch, plain-end pipe was used. Fittings were attached by solvent cementing. The 90 lengths of pipe were coupled at the rate of almost a joint a minute.

* * *

National Polyvinyl Chloride Plastic Pipe is available in two types, in sizes ½" to 6" inclusive and in Schedules 40 and 80.

NORMAL-IMPACT—for installations requiring the highest chemical resistance attainable, together with high strength and excellent creep resistance.

HIGH-IMPACT—for installations requiring excellent chemical resistance and a high degree of toughness even at low temperatures.

Polyvinyl Chloride Pipe possesses high chemical resistance to acids, alkalis, salt solutions, alcohols and many other chemicals. It is rigid and light weight . . . can be joined by threading (Schedule 80 only), by solvent cementing, heat welding or with adhesives. National Polyvinyl Chloride Plastic Pipe is marked every 2 feet with size, schedule, pressure and temperature.

Nontoxic, the pipe resists deterioration from sunlight, fungi, bacterial action and soils. Its smooth internal surface offers low flow resistance.

For further information on USS National Polyvinyl Chloride Plastic Pipe, send for Bulletin No. 24. Write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

*Trademark

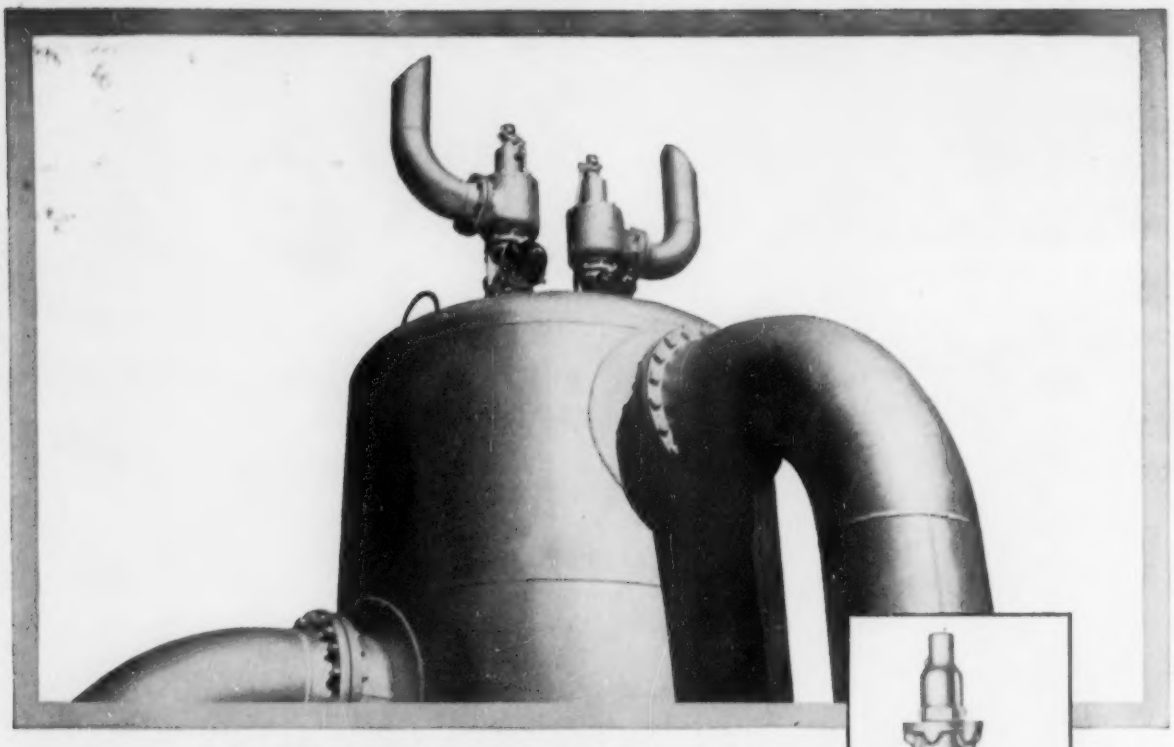
Fitting being solvent-cemented in place.

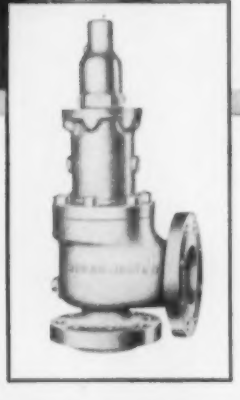
NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.

COLUMBIA GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS NATIONAL *plastic* PIPE

UNITED STATES STEEL





★ Economical "2 in 1" Design
★ Peak Performance
★ Absolute Protection
★ Maximum Interchangeability

CONSOLIDATED SAFETY RELIEF VALVES GIVE YOU ALL FOUR—AND MORE

Consolidated Safety Relief Valves satisfy *every* requirement of the most advanced processing facilities. Valve action is *consistently* positive. You get peak performance even where discharge lines are long or there is low "superimposed" back pressure in the relieving system!

The Standard type can be converted to Bellows type *in the field*. Center-to-face dimensions of inlet and outlet are such that you can interchange these valves with the safety relief valves of other manufacturers. Real flexibility of application that cuts inventory costs! Optically-ground flat seating surface and fewer functional parts than comparable valves contribute greatly to easier, more economical maintenance.

Get top economy and absolute protection with Consolidated Safety Relief Valves. Full range of sizes and pressures available. Write for Catalog 1900 for complete information.

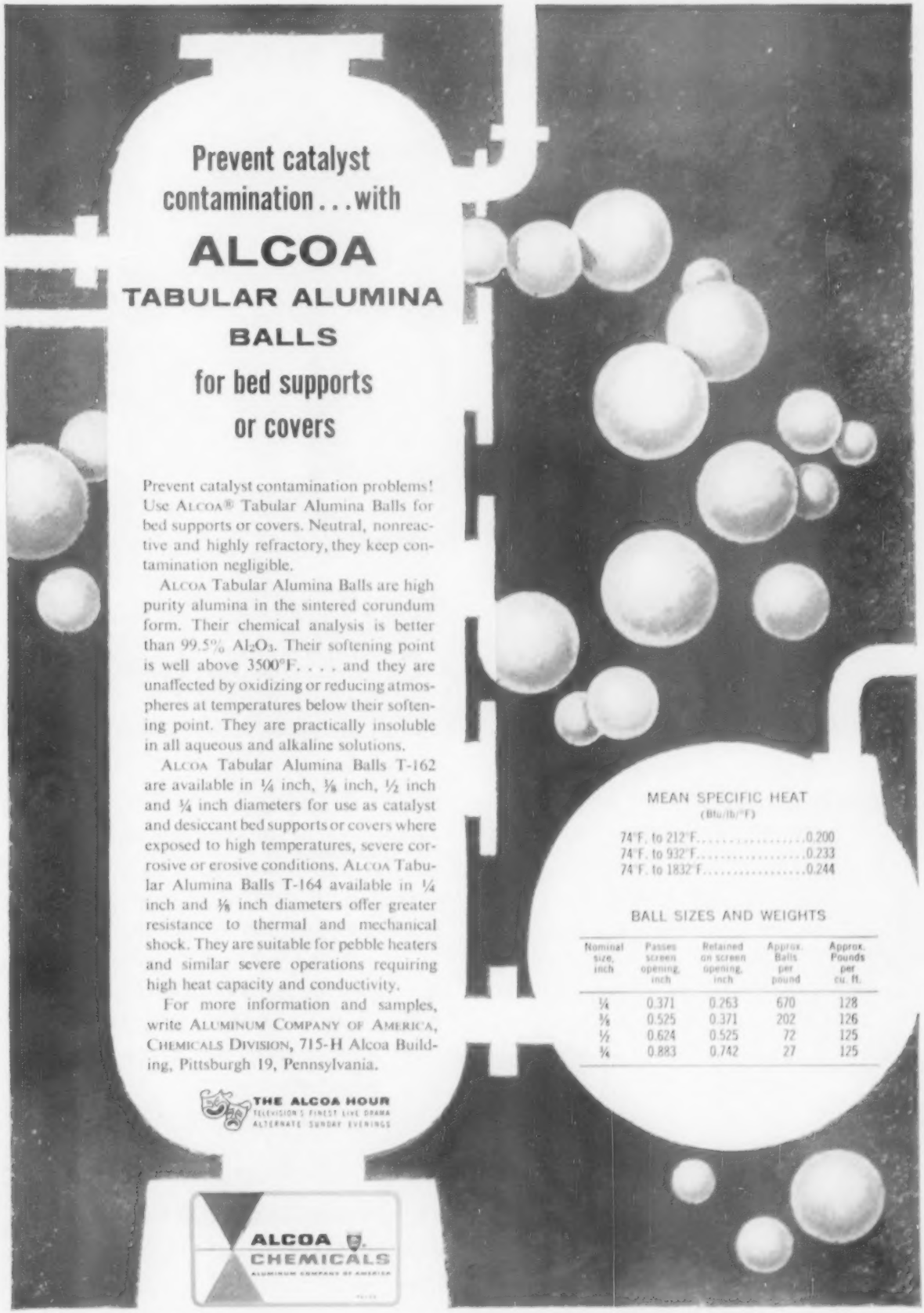
CERTIFIED AND APPROVED. Both Standard and Bellows Valves are approved under API-ASME and ASME Unfired Pressure Vessel Codes and are certified by the National Board of Boiler and Pressure Vessel Inspectors.

In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

CONSOLIDATED SAFETY RELIEF VALVES

A product of **MANNING, MAXWELL & MOORE, INC.** TULSA, OKLAHOMA

MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, *Stratford, Conn.* 'HANCOCK' VALVES, *Watertown, Mass.* AIRCRAFT CONTROL PRODUCTS, *Danbury & Stratford, Conn. and Inglewood, Calif.* "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*



Prevent catalyst contamination . . . with

ALCOA

TABULAR ALUMINA BALLS

for bed supports or covers

Prevent catalyst contamination problems! Use ALCOA® Tabular Alumina Balls for bed supports or covers. Neutral, nonreactive and highly refractory, they keep contamination negligible.

ALCOA Tabular Alumina Balls are high purity alumina in the sintered corundum form. Their chemical analysis is better than 99.5% Al_2O_3. Their softening point is well above 3500°F. . . . and they are unaffected by oxidizing or reducing atmospheres at temperatures below their softening point. They are practically insoluble in all aqueous and alkaline solutions.

ALCOA Tabular Alumina Balls T-162 are available in ¼ inch, ⅜ inch, ½ inch and ¾ inch diameters for use as catalyst and desiccant bed supports or covers where exposed to high temperatures, severe corrosive or erosive conditions. ALCOA Tabular Alumina Balls T-164 available in ¼ inch and ⅜ inch diameters offer greater resistance to thermal and mechanical shock. They are suitable for pebble heaters and similar severe operations requiring high heat capacity and conductivity.

For more information and samples, write ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 715-H Alcoa Building, Pittsburgh 19, Pennsylvania.

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

ALCOA CHEMICALS
ALUMINUM COMPANY OF AMERICA

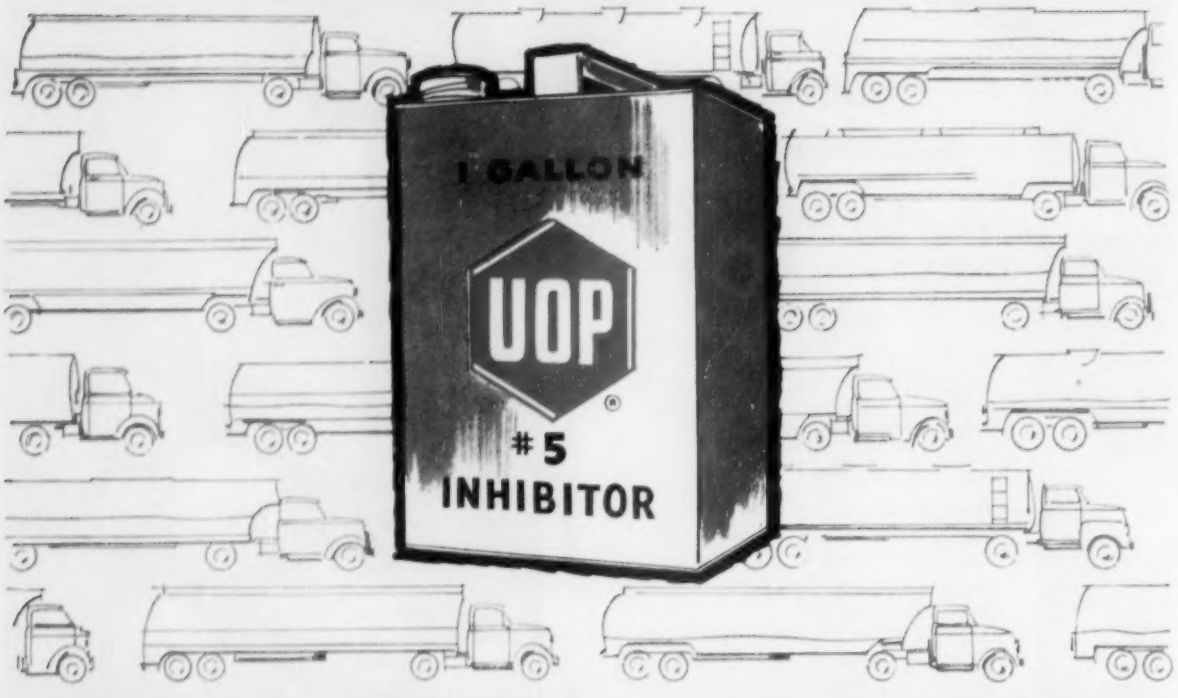
MEAN SPECIFIC HEAT
(Btu/lb/°F)

74°F. to 212°F.	0.200
74°F. to 932°F.	0.233
74°F. to 1832°F.	0.244

BALL SIZES AND WEIGHTS

Nominal size, inch	Passes screen opening, inch	Retained on screen opening, inch	Approx. Balls per pound	Approx. Pounds per cu. ft.
¼	0.371	0.263	670	128
⅜	0.525	0.371	202	126
½	0.624	0.525	72	125
¾	0.883	0.742	27	125

IT TAKES ONLY ONE GALLON OF UOP #5...



TO KEEP 100,000 GALLONS OF GASOLINE GUM-FREE

UOP #5 Inhibitor is the most economical you can use. And by experience and test it is also the best—the only inhibitor that can handle the really tough stability jobs.

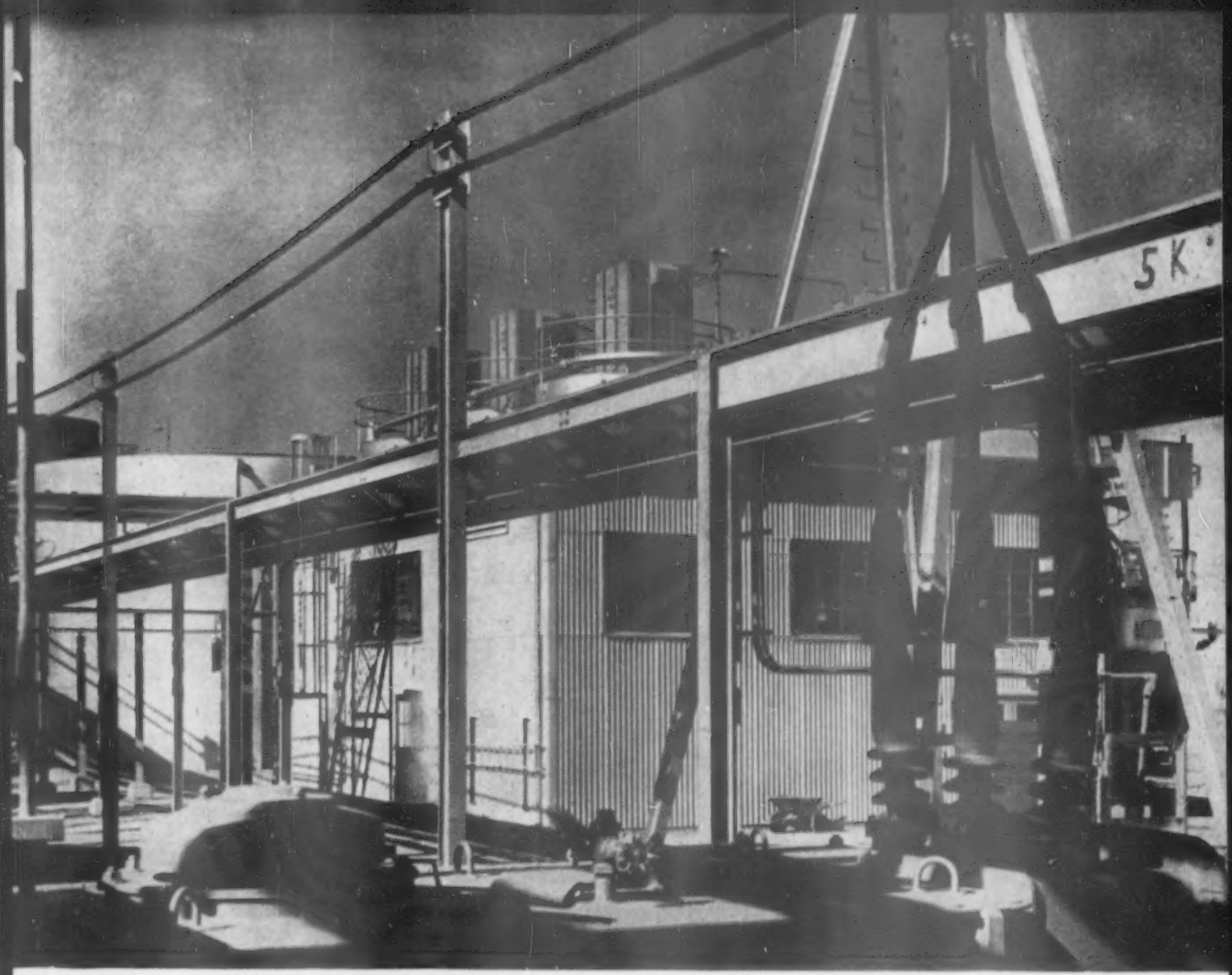
Actually, only 5 molecules of UOP #5 will protect as many as 1,000,000 molecules of today's tailor-made gasoline from the formation of gum, the one universally recognized cause of engine manifold deposits. It's effective, too, in preventing the decomposition of TEL in stored gasoline. Is it any wonder that UOP #5 is the standard of comparison in the industry?

Just as the methods of making better gasoline keep changing, so do the techniques of finishing gasoline for maximum gum stability and engine cleanliness. We will be glad to share our experience in this field with you in attacking a current stability problem or in reducing costs on present processing. Just write us.

PRODUCTS DEPARTMENT

UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD, DES PLAINES, ILLINOIS, U.S.A.



Heads above the crowd, Anaconda Aerial Cable makes a fast, neat, low-cost installation at oil refinery.

How to handle high voltage with a low overhead

Anaconda Aerial Cable goes over crowded areas... gives highly reliable service at low cost.

Pipes and other underground structures often make installation of ducts or buried cable costly and difficult. The ideal answer: Anaconda Aerial Cable.

See how easy it is to install—no ducts, crossarms or insulators are needed. Even if underground obstructions are not a factor, this rugged neoprene-jacketed cable costs much less than buried systems.

Neoprene jacket resists weather and abrasion. Special Anaconda Type AB butyl high-voltage insulation gives extra protection against ozone, heat, moisture and fumes.

For the full story, call the Man from Anaconda or your nearest Anaconda distributor. For information on Aerial Cable write to: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 56267

1. Conductors—copper or aluminum
2. Ozone-, moisture- and heat-resistant butyl insulation
3. Neoprene weather-resistant jacket
4. Messenger
5. Binder Tape

ASK THE MAN FROM **ANACONDA®**
FOR **AERIAL CABLE**

THESE VALVES SAVE

OPERATING DOLLARS

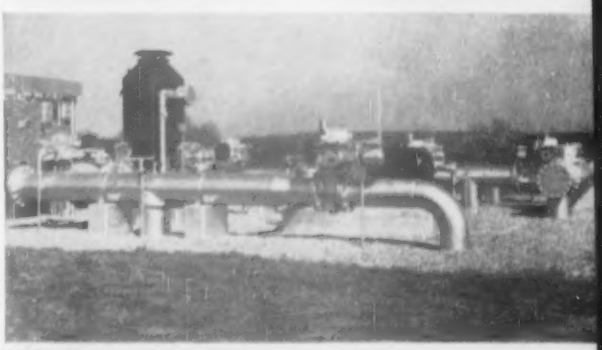
. . . reduce maintenance and down time costs

GAS PIPELINES

For forty years, pressurized lubricant sealing in Rockwell-Nordstrom valves has proven the safest way to control natural gas. And lubricant sealing *stays* safe . . . a turn of the lube screw provides a new seating surface *instantly*. Reseating costs and down time are lower than with any other valve.

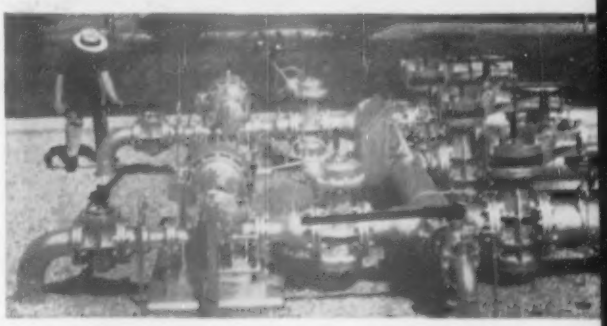
CRUDE PIPELINES

Quarter-turn operation in Rockwell-Nordstrom valves means faster, smoother closure at any pressure. Straight-through flow prevents packing and seat fouling (Rockwell-Nordstrom valve seats are *never* exposed to line fluid). Also, the firmly seated plug and rugged construction prevent costly shock load failures on pulsating flow.



PRODUCTS PIPELINES

Tight manifolding is easier with *compact* Rockwell-Nordstrom valves. Product contamination is eliminated by leakproof, positive shut-off. And lubricant prevents metal-to-metal friction wearing to slash maintenance costs. For power operation, quarter-turn, lubricated closure means simpler, less costly actuators.



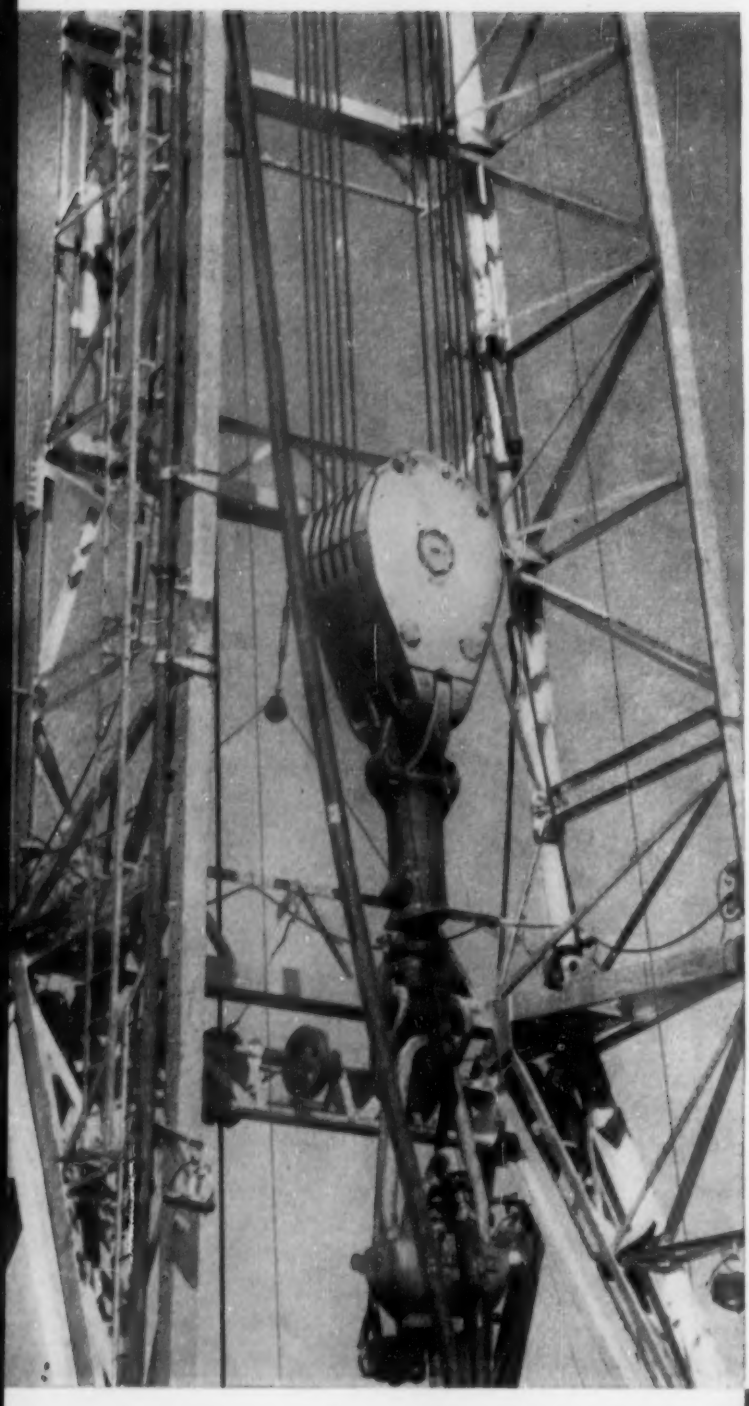
Rockwell-Nordstrom valves are available in a complete range of sizes and pressure ratings for every pipeline need. We'll be glad to send you more information on how you can stay on stream at lower cost with Rockwell-Nordstrom pipeline valves. Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania. *Canadian Valve Licensee:* Peacock Brothers, Limited.

Available at leading suppliers . . . everywhere

ROCKWELL-Nordstrom VALVES

Lubricant Sealed For Positive Shut-Off

40th YEAR *of lubricated plug valve leadership*



Heavy... Stable... Free-Falling

This is the Mister Big of the Bethlehem B-line Traveling Blocks. It's the B-55 equipped with five sheaves. It can also be furnished as an even heavier six-sheave model.

Though top dog among the Bethlehem traveling blocks, the "55" shares its many good features with other blocks in the Bethlehem line. From the smallest unit right up to the big guy, they're all extra-heavy, with the weight distributed perfectly. Each is balanced exactly as it should be.

The advantages of this careful proportioning are obvious. You get less sidesway; faster falling when block is traveling empty; maximum operating smoothness.

And here's another feature deserving mention: the bearings. Each sheave is equipped with a two-row tapered roller bearing, which is individually lubricated. This means smoothness-*plus* — the plus being longer life of vital components.

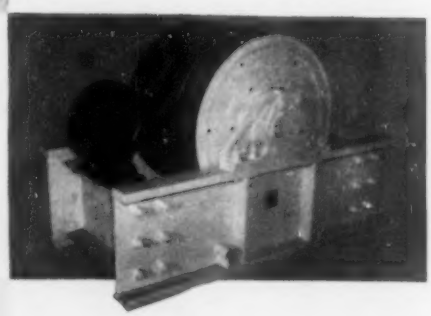
B-line blocks are the finest Bethlehem has ever built. We invite you to make a thorough study of these advanced units before you buy. For detailed information, call our nearest office or store.

Which one meets your needs?

MODEL	RATING	WT WITH BAIL, LB
B-30-3*	100 tons	3020
B-30-4*	90 tons	3520
B-36-4*	160 tons	6195
B-42-4*	250 tons	10009
B-42-5*	250 tons	11300
B-55-5	450 tons	19850
B-55-6	450 tons	22030

* Can be unitized with the commonly used types of hooks.

Bethlehem also manufactures a heavy-duty crown block, the B-55-7. Rating, 525 tons; wt, 16450 lb.



BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second St., Tulsa, Okla.

West Coast Headquarters: Los Angeles, Calif.

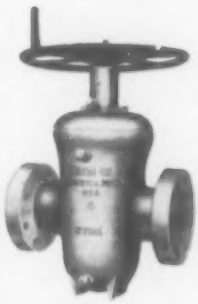
Export Distributor:
Bethlehem Steel Export Corporation
25 Broadway, New York, N. Y.

BETHLEHEM STEEL

BETHLEHEM SUPPLY

BETHLEHEM SUPPLY

Whatever your Completion...



FOR 1000 TO 5000 LB.

MODEL "L" VALVE

The industry's top ranking valve for Christmas trees, flow lines, etc. Sizes: 2" to 4". Working pressures: 1000 to 5000 lb. WOG.

W-K-M VALVES GIVE YOU BETTER CONTROL- MORE DEPENDABLE PERFORMANCE

Whether it's a single or dual completion, low or high pressure, oil or gas, W-K-M has the valve you need for maximum performance and dependability in your well control system.

These basic design and operating advantages are common to all W-K-M Valves:

- THROUGH-CONDUIT
- PARALLEL EXPANDING GATE
- PRESSURE SEAL BONNET
- LARGE PROTECTED SEATING AREA
- NO TURBULENCE
- MINIMUM PRESSURE DROP
- DOUBLE ROW THRUST BEARINGS
- SUPERFINISHED STEMS

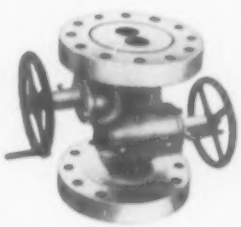
FOR 10,000 AND 15,000 LB.

BALANCED STEM VALVES

The heavy stem loads, set up by high pressure, are balanced out in this valve so that it opens or closes with one hand under full rated pressure. Sizes: 2" and 3⅛". Working pressures: 10,000 and 15,000 lb. WOG.

FOR DUAL COMPLETIONS

DUAL VALVE



Two valves in one body. Dual completion efficiency is greatly increased and assembly simplified. These valves are available in 2" and 2⅛" sizes for running two tubing strings in 7" or 8⅝" casing.

Specify W-K-M Valves on your next Christmas tree and well control system.

W-K-M MANUFACTURING COMPANY, INC.
A SUBSIDIARY OF QCF INDUSTRIES INCORPORATED

PLANT: MISSOURI CITY, TEXAS
MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

MANUFACTURERS OF

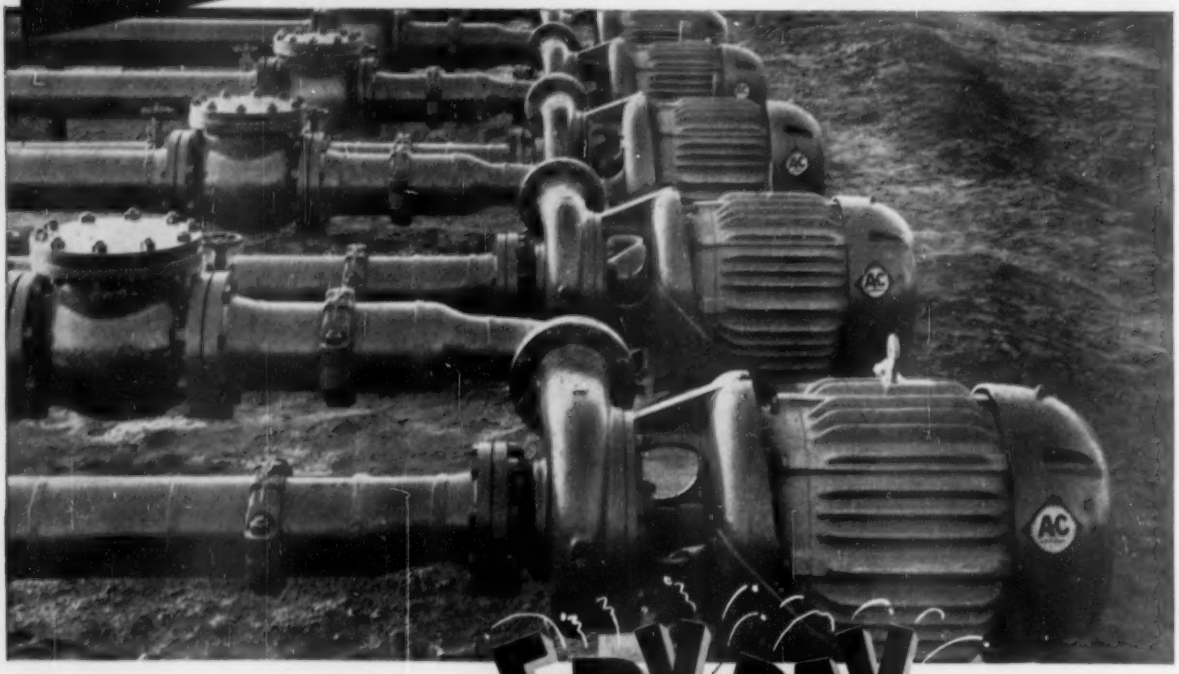
W-K-M	QCF	KEY
THROUGH-CONDUIT GATE VALVES	LUBRICATED PLUG VALVES	RETURN BENDS AND FITTINGS

SKTD

RECESSED BODY VALVE

The recessed body permits two parallel strings of tubing to be run in 7" or 8⅝" casing for dual completions when dual valve is not used. Sizes: 2" and 2⅛". Working pressures: 2000 to 5000 lb. WOG.

There's **MORE** Cooling Surface in these deep-ribbed **MOTORS**



No Day is FRYDAY

with these Allis-Chalmers MOTORS

● Frying of insulation is impossible under normal conditions with the extra-large cooling surface of Allis-Chalmers rib-type TEFC motors. The result—you expect and get longer motor life.

The engineered partner of A-C motors is Allis-Chalmers control.

Get Complete Information

As a new machinery component or as replacement, specify Allis-Chalmers. Discuss your particular application with your nearby A-C distributor, A-C district office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

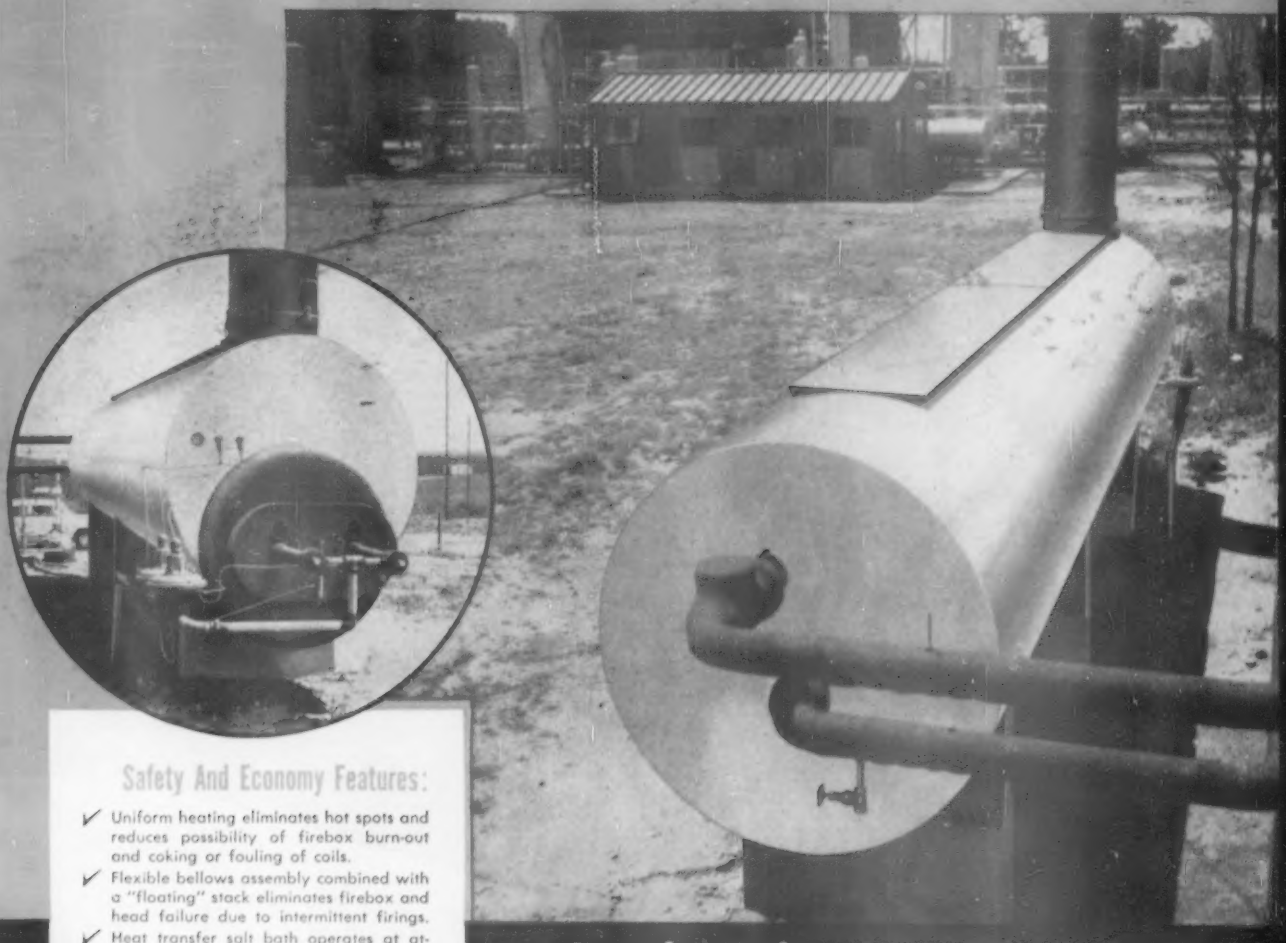
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-4853

New BS&B Salt Bath Heater

Provides Safest Method Of High Temperature Heating!



Safety And Economy Features:

- ✔ Uniform heating eliminates hot spots and reduces possibility of firebox burn-out and coking or fouling of coils.
- ✔ Flexible bellows assembly combined with a "floating" stack eliminates firebox and head failure due to intermittent firings.
- ✔ Heat transfer salt bath operates at atmospheric pressure, and therefore cannot cause vessel rupture.
- ✔ Molten salt is non-corrosive to carbon steel, non-volatile, thermally stable and non-toxic.
- ✔ Ample space for the salt has been provided to prevent "boiling over". Salt requirements have been minimized for greater economy.
- ✔ Reliable BS&B heater controls with dual temperature controls are standard equipment. BS&B pilot light permits either snap-acting or throttling burner controls with minimum possibility of pilot failure.

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

...Provides Uniform Heating Up To 800°F.!

BS&B now offers a complete new line of Salt Bath Heaters with capacities ranging from 75,000 to 6,000,000 BTU/Hr. A wide selection of coils of various sizes and pressure ratings makes them adaptable to virtually any application requiring uniform heating up to 800° F.

These units are ideally suited for the heating of oil, paraffins and gas (as in the reactivation of dry desiccant dehydrators). They may also be used in fractionater reboiler service and other low pressure drop applications.

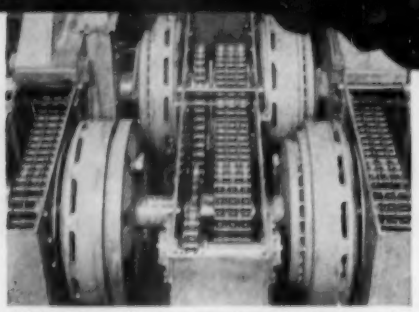
For complete details on the new BS&B Salt Bath Heater, contact your nearest BS&B Representative, or write to . . .

BLACK, SIVALLS & BRYSON, INC.

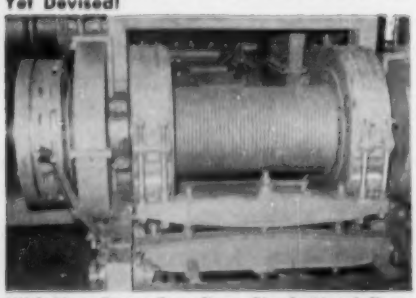
Oil & Gas Equipment Division, Dept. 1-A8
1708 West Main Street, Oklahoma City, Oklahoma

THE ALL NEW Wilson super giant rig

be modern-
buy Wilson



- *With New Three Speed and Reverse All Friction Clutch Transmission.*
- **Available with Parkersburg 22" Single Hydromatic Brake Mounted on Transmission with 6 Speeds Between Drum and Brake — The Best Hydromatic Brake Arrangement Yet Devised!**



- **With New Beam Equalizer, Single Nut Adjustment Lever Type Brake which CANNOT KICK.**
- **Oil Bath Drum Drive Chains Outside Frame.**
- **High and Low Clutches on End of Drum Shaft.**
- **Heavy Plate Chain Cases and Covers.**

unquestionably...the most advanced

and modern rig in the world today

YOU OWE IT TO YOURSELF TO INVESTIGATE
THIS NEW AND MODERN RIG BEFORE BUYING

Write for Full Details

WILSON MANUFACTURING CO., INC.

WICHITA FALLS, TEXAS • **the home of RED IRON**

Let this "Visiting Fireman" train your men to fight fire . . . it could save your business

You have a *potential* fire-fighting team right in your plant. These would-be fire fighters *could save your business if fire struck unexpectedly.* All they need is training, the kind that will enable them to respond instantly and properly to any kind of fire emergency.

Ansul can provide this training for a group of your men just as it has for hundreds of its customers. And there will be no charge. It is just one of the "essential" services that Ansul provides for its customers.

Twenty years experience in the fire protection industry has proved to Ansul many times over that all the fire equipment in the world will not save your business *unless* trained hands are available to man that equipment. So, it is important to Ansul that you get *training* along with the fire equipment you buy. Only then will you experience the security that goes with having a complete fire protection program. Only then will you get what you really pay for, what you really need—*complete fire protection.*

You owe it to the life of your business to learn more about Ansul's in-plant fire training service. Get in touch with your local ANSUL MAN through the yellow pages of your phone directory, he will be happy to call on you and explain all of Ansul's customer services in detail. Or write to THE ANSUL CHEMICAL COMPANY, Dept. OG-8, Marinette, Wisconsin.

ANSUL

Hold Everything!

Heavy casing loads . . . light casing loads . . . low pressures or high, and any loads and pressures in between. It holds everything! That's the new Cameron "CA" Casing Hanger. It's altogether different from any other casing suspension and seal.

The "CA" Hanger is interchangeable in all regular Cameron casing heads. It is fully automatic in operation and can handle pipe loads to joint strength without damage to the pipe. On the other hand, its self-energizing resilient seal is so efficient that it effectively and automatically seals off highest pressures even though the casing load may be extremely low.

Design work on the Cameron "CA" Casing Hanger started years ago. Scores of experimental hangers were produced and put through the most destructive and thorough laboratory and field tests imaginable. Each contributed something to the final "CA" design . . . the ultimate in a safe, flexible, universal casing hanger. Now, regardless of size, weight, and grade of pipe, it can be safely suspended and sealed with a Cameron "CA".

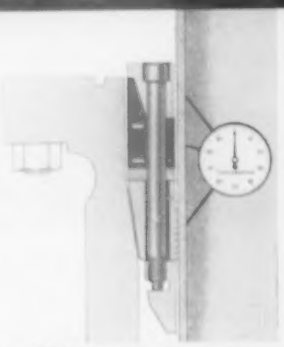
Hold everything . . . until you have inspected this truly remarkable casing hanger. Better still, order one now for your next casing string.

Cameron

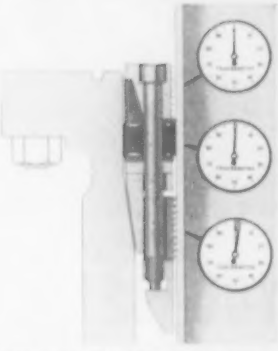
IRON WORKS, INC.

P. O. Box 1212—Houston, Texas

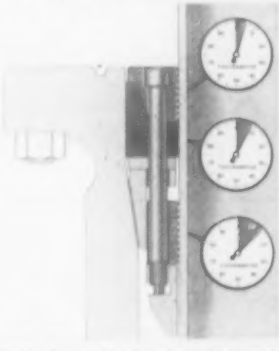
Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works Ltd., Time & Life Bldg., New Bond Street, London W. 1 England.



● **INITIAL CONTACT — NO PIPE LOAD** — Segmented floating bowl will not set prematurely, but provides instant gripping upon contacting the taper in the casing head.

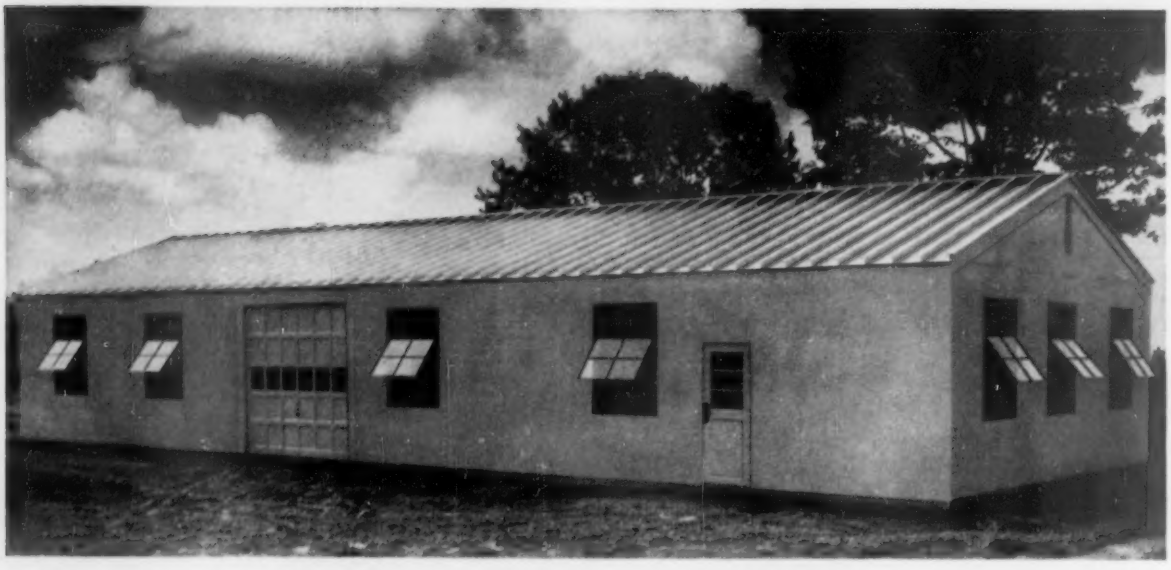


● **LIGHT PIPE LOAD, YET SEAL IS EFFECTED** — Under a few thousand pounds pipe load and with only lower slip segments engaged, self-energizing resilient seal effects pressure-tight packoff. Note only slight deflection in pipe.



● **MAXIMUM PIPE LOAD — MINIMUM DEFLECTION** — Higher loads increase compression in packing and thereby cause upper slip segments to engage pipe. Thereafter, increases in casing load are distributed to all slip segments. The yield strength of the pipe is not exceeded at joint strength. Pressure loads are carried directly to the seat in the casing head.

● The "CA" Hanger is of the popular wrap around design which may be dropped or lowered through preventers for automatic setting and sealing, and is interchangeable in all regular Cameron casing heads and spools.



YOU GET LOW-COST COMFORT *IN ANY CLIMATE*

with an ARMCO STEEL BUILDING

HOT WEATHER	An Armco Steel Building painted white is as cool as any building can be (without mechanical cooling equipment).
COLD WEATHER	Interlocking STEELOX Panel joints are weather-tight. Wind and water can't get in. And any standard insulation material can be used where desired.

Whatever the weather, you *are* comfortable (and machines and equipment are protected) in an Armco Steel Building. This is one reason why you'll find Armco Buildings doing a lot of different jobs in the oil country—offices, living quarters, repair shops, garages and stores for example. Here are more benefits.

- **Wide size range—up to 60-foot clear-span widths**
- **Clean, attractive lines**
- **Durable, noncombustible all-steel construction**
- **Little or no maintenance**
- **Easily expanded to meet future needs**
- **Backed by Armco experience and reputation**
- **Erection service available**

Write us for complete information. Armco Drainage & Metal Products, Inc., 3776 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO STEEL BUILDINGS

ARMCO

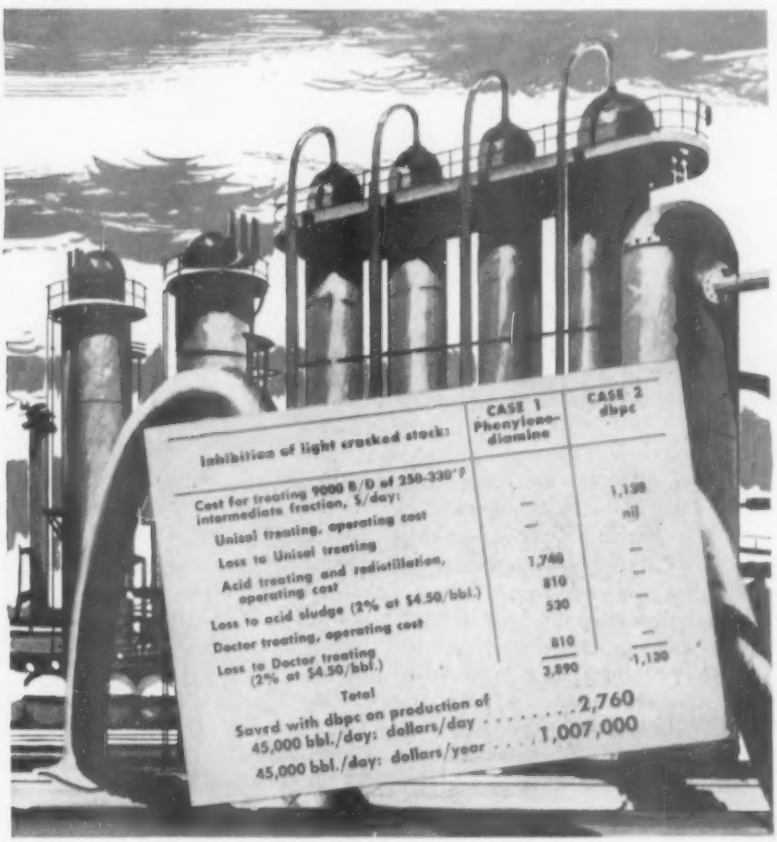
How oil refiner saves $1,000,000 with dbpc® antioxidant

(a quality chemical that Koppers makes)

dbpc antioxidant (di-tertiary-butyl-para-cresol) not only keeps auto engines clean, but *cuts the cost* of inhibiting gum formation. Here is how **dbpc** is saving one large refiner over $1,000,000 a year since switching to this quality Koppers antioxidant:

This refiner splits its full-range thermal cracked and catalytic cracked gasoline (FCC-TCC) streams into light and heavy fractions. The light portions have a high end point of 330° F.

Phenylenediamine formerly was used to inhibit the light cracked stocks. But with Unisol sweetening this inhibitor caused excessive "Lauson" and ISD type gum formation if the high end point was raised above 250° F. As a result, some of the light stocks, with end points from 250° to 330° F, had to be acid treated, redistilled, and doctor sweetened along with the heavy fractions. This was more expensive than Unisol sweetening, so the refiner looked for a way to treat the *entire* light fraction by Unisol sweetening.


Inhibition of light cracked stock:
CASE 1 Phenylene-diamine
CASE 2 dbpc
Cost for treating 9000 B/D of 250-330° F intermediate fraction, $/day:
Unisol treating, operating cost — 1,130
Loss to Unisol treating — nil
Acid treating and redistillation, operating cost 1,760 —
Loss to acid sludge (2% at $4.50/bbl.) 810 —
Doctor treating, operating cost 530 —
Loss to Doctor treating (2% at $4.50/bbl.) 810 —
Total 3,890 1,130
Saved with dbpc on production of 45,000 bbl./day: dollars/day 2,760
45,000 bbl./day: dollars/year 1,007,000

dbpc antioxidant solved this problem. With this inhibitor, a high end point of 330° F is perfectly satisfactory for the light fraction. No trouble with gum has developed. Inhibition costs about the same as before. But ultimate costs have been drastically reduced—over $1,000,000 a year, figuring an average production of 45,000 barrels a day. This giant saving was realized by eliminating the expensive acid treating, redistillation, and doctor sweetening of the 250° to 330° F fraction.

Remember, you get more effective inhibition with Koppers **dbpc** because you add it *early* in the refining process before much oxidation occurs — and none of the **dbpc** is lost in later refining steps. Leaded or unleaded gasoline treated with **dbpc** will not darken or discolor. **dbpc** does not induce tank sweetening. It is not extracted by aqueous corrosion inhibitors. Most important—it can save you money. Write for full technical details, or get in touch with the nearest Koppers Sales Office. Koppers Company, Inc., Chemical Division, Dept. OGJ-86, Pittsburgh 19, Pennsylvania.

KOPPERS

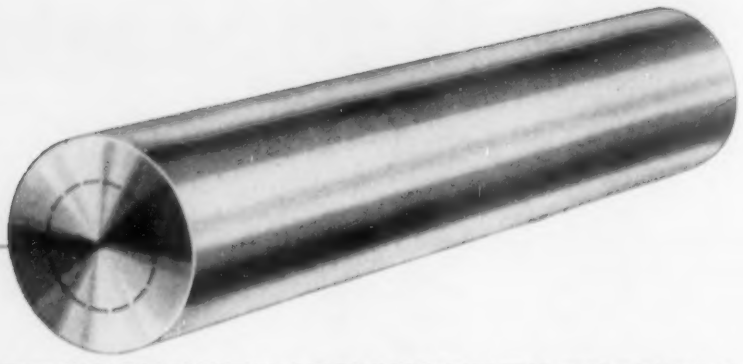
KOPPERS CHEMICALS

SALES OFFICES: New York • Boston • Philadelphia • Atlanta • Houston • Chicago • Detroit • Los Angeles • San Francisco

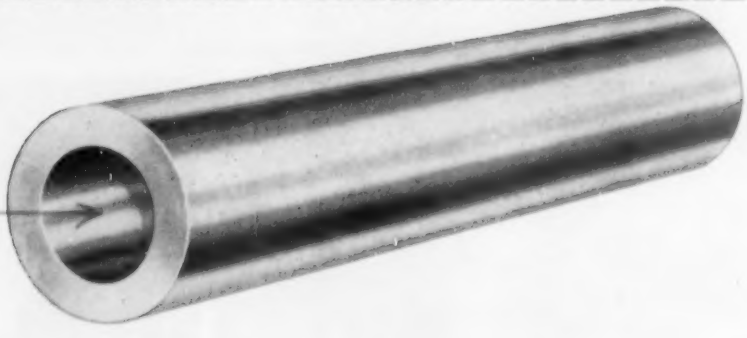
In Canada: Dominion Anilines and Chemicals Ltd., Toronto, Ontario

Buying bar stock for hollow parts?

Why pay for all this steel



When you can start with this?



Buy TIMKEN® seamless steel tubing

If you're making hollow parts, and bore cut *solid* bar stock, you're paying for steel you don't use. But Timken® seamless steel tubing comes with *the hole already there.* You pay only for steel you use. On top of this saving, you cut machining costs. By eliminating that unnecessary boring operation, you free part of your screw machines for other jobs—add machining capacity without adding machines.

Our engineers will be glad to recommend the most economical tube size for your hollow parts job. By studying your problem and making recommendations, they'll save you money—and the Timken seamless steel tubing they suggest will be guaranteed to clean up to your finished dimensions.

The piercing process by which Timken seamless steel tubing is made is basically a forging operation. You get *fine forged quality*—a uniform spiral grain flow for greater strength, and a refined grain structure. And through our rigid quality control uniform quality is maintained from tube to tube, heat to heat and order to order.

The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

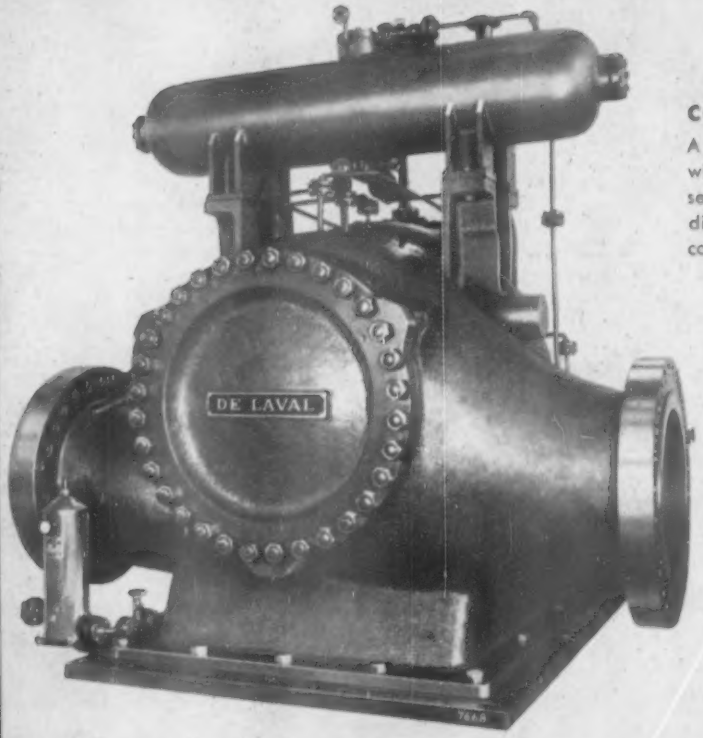
TIMKEN *Fine Alloy* **STEEL**

TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

DE LAVAL
CENTRIFUGAL PIPELINE COMPRESSORS

come in two "packages" for easy installation

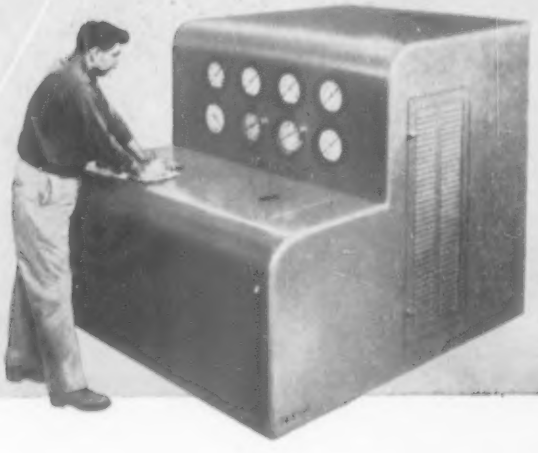


COMPRESSOR

A De Laval compressor with its emergency seal tank mounted directly on the compressor.

CONSOLE

The console contains the filters, motor-driven pumps, coolers, pressure switches, gauges and other accessories. It eliminates complicated piping on the packaged compressor . . . also serves as a protective cover for the equipment it houses.

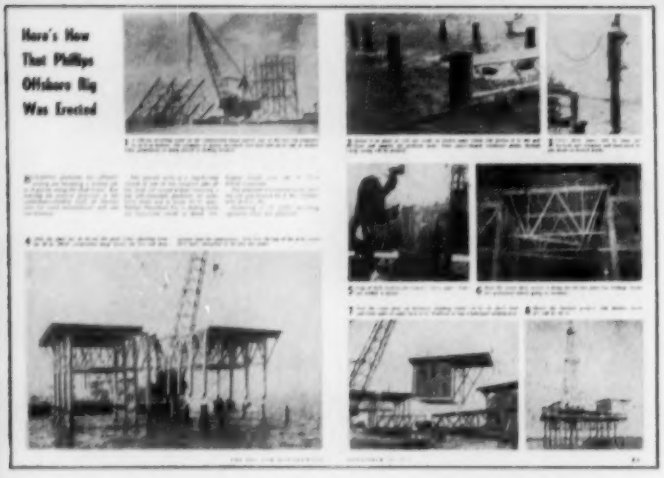


Bulletin 503 gives data on De Laval centrifugal pipeline compressors. Write for your copy.

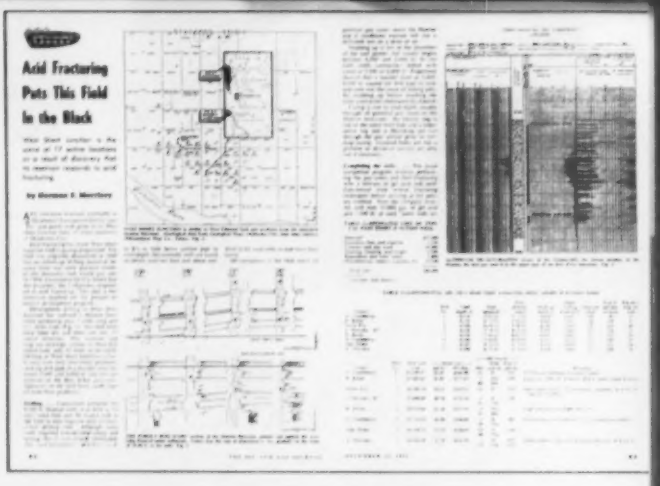
Designed in two packages, rugged De Laval centrifugal compressors offer many important engineering features. Among these are • high pressure contact shaft seal which eliminates gas leakage • heavy and rigid construction throughout • high load carrying capacity. The compressor and console arrangement makes De Laval centrifugal compressors easy to install—only simple low-cost foundations are required. De Laval units, totaling more than 280,000 horsepower, are now in operation on major pipelines.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
810 Nottingham Way, Trenton 2, New Jersey

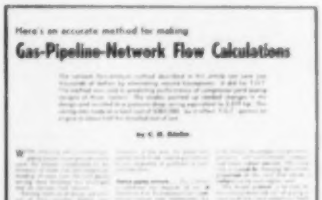


1 In this all-picture story, the numbered, orderly sequence of pictures guides the reader across the spread and gets the idea off the page and into the reader's mind with maximum impact.



2 Although a map, cross-sections, and coregraphs are all on the same spread, logical arrangement gets the story off the page. The lead is a challenging question which the author answers.

How To Make Art, Headlines, Pictures, And Text Work Together For Better Readership



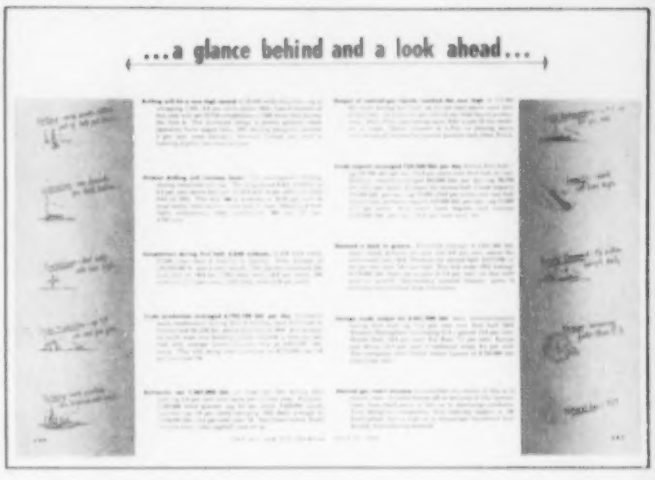
5 Important points are boxed as a supplement to the deck, which serves as a form of editors' recommendation.

This is the third in a series of "workshop" advertisements on the technology of building better business magazine readership.

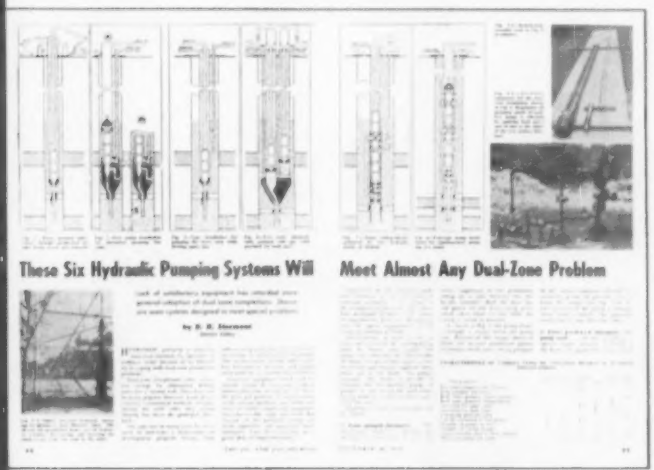
We call it *story organization* at The Journal. It's the skill of our presentation editors to make the various elements of an article work together so that all three levels of readership are served — the "scanners," the "skip-readers," and the "thorough" readers. Thus by "sampling," the reader can participate in a story to

THE OIL AND

3 Massing before-and-after pictures makes them work harder, and gets the story off to a running start. Such pictures have impact, and assure readers the article merits consideration.



4 This spread illustrates the third level of editorial presentation...skillfully written abstracts of a 48-page special industry-wide review and outlook section compiled by Journal editors.



6 Here the title of the article reads directly out of the illustrations of the equipment. This is an effective interplay, because the elements work together for greater impact of the layout.

7 Use of headlines as cutlines make both pictures and the title more effective. Unnecessary captions overload layout.

8 Editorial art conveys basic trends for the "scanner;" at the second level, it invites the thorough reader into the story.

exactly the degree that it meets his requirements. This is the *next dimension* of modern journalism, and at The Journal this multi-level presentation receives as much editorial attention as the text of the story itself. Editing like this is new, progressive, and you'll find it only in leading publications.

GAS JOURNAL

TULSA, OKLAHOMA

You guess . . . we can't!

10 YEARS AGO *THIS FAMILIAR SILHOUETTE ON THE OIL FIELD HORIZON WAS EASILY DISTINGUISHED AS A*

LUFKIN

TODAY . . . *MUCH CLOSER SCRUTINY IS NECESSARY TO IDENTIFY THE MANUFACTURER OF THIS PUMPING UNIT*

DO NOT BE MISLED BY APPEARANCE

SEE OUR CATALOG IN THE COMPOSITE CATALOG

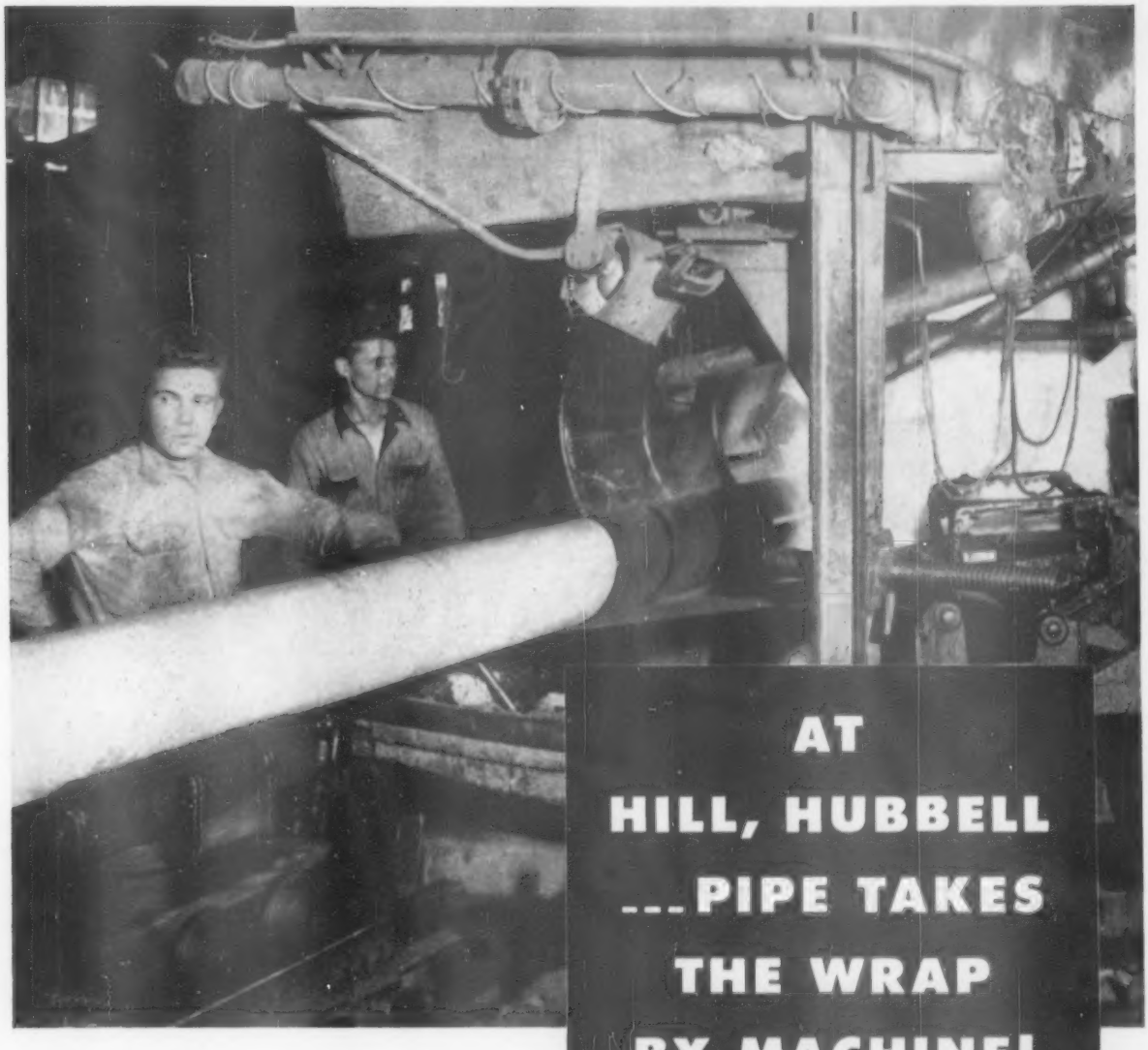
"Look beneath the surface; let not the several quality of a thing nor its worth escape thee"..... *Marcus Arelius*

Lufkin **FOUNDRY & MACHINE COMPANY**

LUFKIN, TEXAS

Branch Sales and Service: Houston • Dallas • New York • Tulsa • Los Angeles • Seminole • Oklahoma City • Corpus Christi • Odessa Kilgore • Wichita Falls • Casper, Wyoming • Great Bend, Kansas • Effingham, Illinois • Duncan, Oklahoma Brookhaven, Mississippi • El Dorado, Arkansas

Lufkin equipment in Canada is handled by THE LUFKIN MACHINE CO., LTD., 9950 65th Avenue, Edmonton, Alberta, Canada 3913 18th Avenue, Regina, Saskatchewan, Canada



AT HILL, HUBBELL ... PIPE TAKES THE WRAP BY MACHINE!

You are looking at one of the reasons Hill, Hubbell is an industry leader in pipe protection. Multiple layers of hot coatings are applied simultaneously as primed pipe is spirally driven through stationary coating and wrapping *machines*—under roof where every factor, including the weather, is controlled!

Contrast this precise method with other coating and wrapping systems. As with so many improvements in pipe protection, mill coating and wrapping was originated by Hill, Hubbell and is—

Another "first" pioneered by the first name in pipe protection

FACTORY APPLICATORS OF COATINGS AND WRAPPINGS

HILL·HUBBELL & COMPANY

DIVISION OF GENERAL PAINT CORP. • 3691 MAYFIELD ROAD, CLEVELAND 18, OHIO

Wagner TRANSFORMERS...THE CHOICE OF LEADERS IN INDUSTRY

Where uninterrupted power is a must...

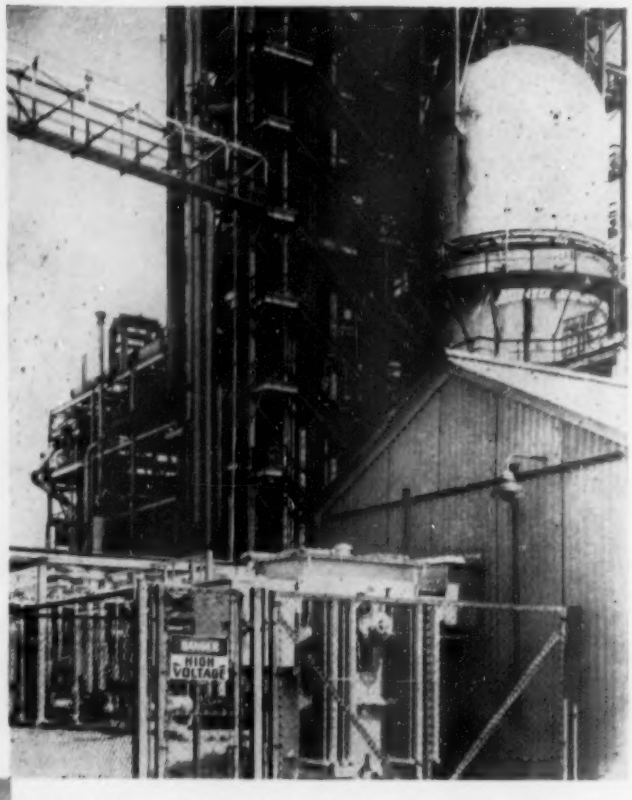
WAGNER UNIT SUBSTATION TRANSFORMERS

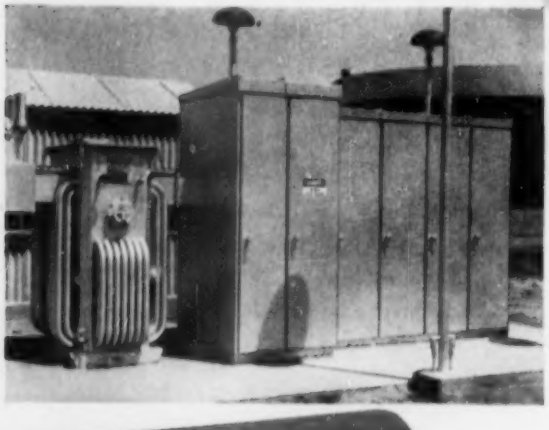
A completely dependable power supply is a vital necessity to an oil refinery. A power interruption of only a few minutes on a "cat cracker," like the one shown at the right, would completely disrupt this important processing operation and cause a shut-down of the entire refinery.

That's why you'll find Wagner Unit Substation Transformers at work at the Carter Oil Company refinery at Billings, Montana.

Wagner transformers are often found in installations where power supply failure would incur great loss because they have a reputation for complete dependability—backed by sixty-five years of transformer building experience.

Wagner Unit Substation Transformers, both liquid-filled and dry-type, are carefully designed to meet distribution requirements. Both liquid-filled and dry-type unit substation transformers are built in ratings through 2000 kva, 15 kv and below—you can choose the type and rating that exactly meets your load-center distribution requirements. Call the nearest of our 32 branch offices, or write us.





The 750 kva, 2400/4160Y to 480 volt, 60 cycle, three-phase, liquid-filled Wagner Unit Substation Transformer feeds the catalytic unit at The Carter Oil Company refinery. At left is shown a 225 kva Wagner substation transformer connected to an outdoor substation at the same refinery. Purchased and installed by The Fluor Corporation, Ltd., Engineers and Constructors for the Petroleum, Chemical and Power Industries, Los Angeles.

* * *

Write for Bulletins TU-205 and TU-214. They give full information on Wagner Unit Substation Transformers. Consult the nearest of our 32 branch offices about your next transformer installation.

Wagner Electric Corporation EST. 1891

Wagner Electric Corporation
6389 Plymouth Ave., St. Louis 14, Mo., U.S.A.

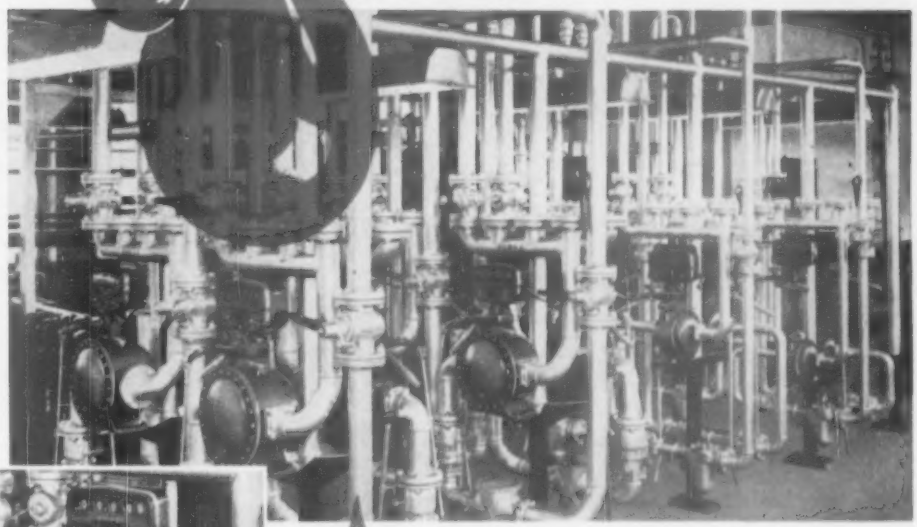
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

9T56-9

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS-AIR AND HYDRAULIC

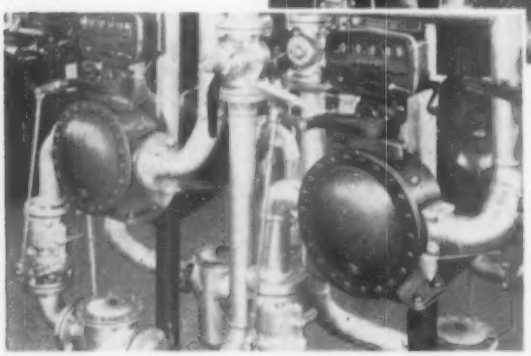
Blending Lube Oils

IN JUST 1/4 THE TIME



16 Brodie BiRotor Meters at Standard Oil Company of California's Richmond Blending Plant are manifolded to a battery of tanks holding over 20,000 gallons each.

BiRotor Meters with Brodie Slow-Closing "Quantrol" valves give shock-free shut-off at exact pre-determined gallonage.



Conventional blending tanks in foreground illustrate complex valve, piping and measuring equipment replaced by automatic metering system.

with BRODIE *BiRotor* METERS

20,000 gallons blended in 1 hour...

...contrasted to 4 hours required by stick measure method

- Over 18 million gallons handled without meter maintenance
- Printed meter tickets keep verified record of base stocks and additives blended in each batch
- Uniform accuracy assured by automatic "Quantrol" shut-off of exact quantity of each component delivered to mixing tank

In this modern blending installation, 16 Brodie BiRotor Meters in a simple manifolded system with a single header replace thousands of feet of pipe and hundreds of valves formerly required to serve the many blending tanks. Quick pre-setting of "Quantrol" valves at central meter manifold, and a single valve at the blending tank, are all that is required. Human error and time consuming stick measurement of manual operation are eliminated. All components flow simultaneously, further reducing blending time. For lower cost installation and operation with maximum accuracy and minimum maintenance, investigate Brodie BiRotors for product blending operations.

BRODIE BiRotor METERS

ALL-STEEL TRUE-ROTARY

RALPH N. BRODIE COMPANY · San Leandro, California, U.S.A.

MT. VERNON, N. Y.	DALLAS 2, TEXAS	CHICAGO OFFICE:	SEATTLE 9, WASH.	LOS ANGELES 22, CALIF.
550 So. Columbus Ave.	167 Parkhouse St.	1227 Circle Ave., Forest Park, Ill.	221 9th Ave. N.	5401 E. Sheila Street

REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

do you want low-cost corrosion or contamination

Acetone • Borax • Calcium Carbide • Calcium Carbonate • Calcium Chloride (Flake) • Ethyl Acetate • Ethyl Alcohol • Ethylene Glycol • Glycerine • Insecticide Concentrates • Soap and Soap Lye • Soda Ash • Sodium Bicarbonate • Sodium Silicate •

CF&I

LECTRO-CLAD* Trademark

Nickel Plated Steel Plates will give it to you

Yes, you can get low-cost, yet effective protection against contamination and corrosion with all these chemicals...and many more!

Effective in heavy industrial applications where the corrosion rate does not exceed 0.0015 inches per year, CF&I LECTRO-CLAD Nickel Plated Steel Plates successfully combine the corrosion and contamination resistance of nickel and the economy and strength of carbon steel.

That's because CF&I LECTRO-CLAD is made by the Bart Process, which consists of electrodepositing a heavy layer of 99% pure nickel on a carbon steel plate. This process results in a permanent bond between the nickel and the steel base. The nickel plating is customarily supplied in the 8-10 mil range; however, it can be plated up to 15-20 mils, if specified.

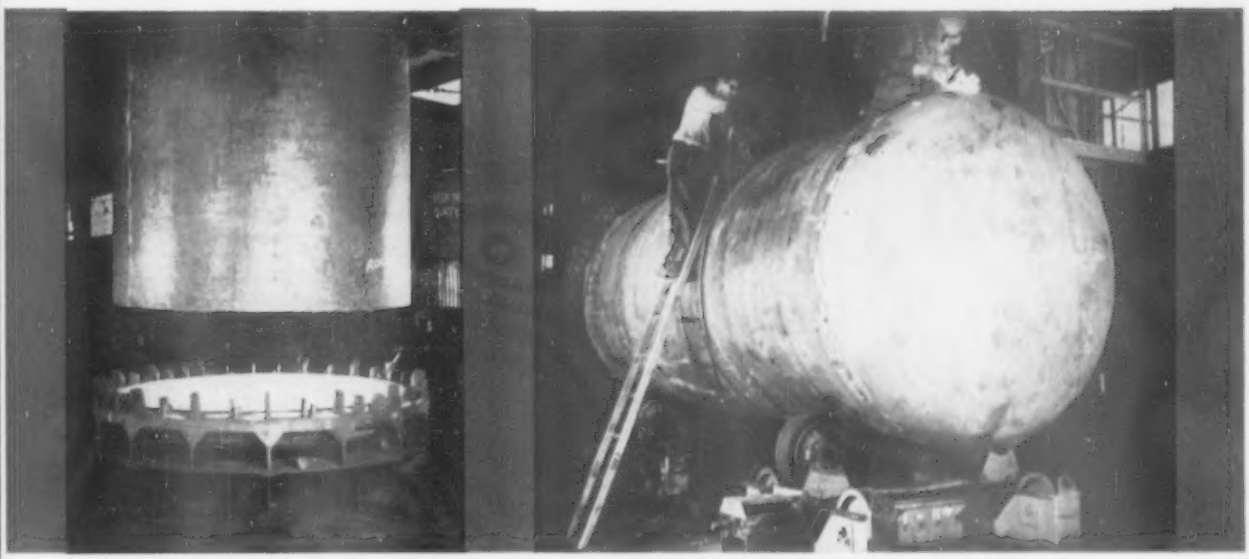
What's more, CF&I LECTRO-CLAD Nickel Plated Steel Plates are easily fabricated without costly special equipment. Just use regular shop equipment and bend it... weld it... roll it—the protective nickel layer will not check, spall or flake!

Ask our nearest sales office for the complete story on economical, effective, easy-to-fabricate CF&I LECTRO-CLAD Nickel Plated Steel Plate today. Wickwire Spencer Steel Division, The Colorado Fuel and Iron Corporation, P. O. Box 1951, Wilmington, Delaware.

*Electroplated by the Bart Process

protection against with these chemicals?

Caustic Soda • Chlorinated Hydrocarbons • Cold Hydrofluoric Acid • Dibutyl Phthalate Methyl Alcohol • Petroleum Catalysts • Phenol • Potash • Resin Plasticizers • Salt Sodium Sulphate • Titanium Dioxide • Tricresyl Phosphate



Assembling a tank fabricated from CF&I LECTRO-CLAD Nickel Plated Steel Plates.

3798

Claymont Steel Products

CF&I

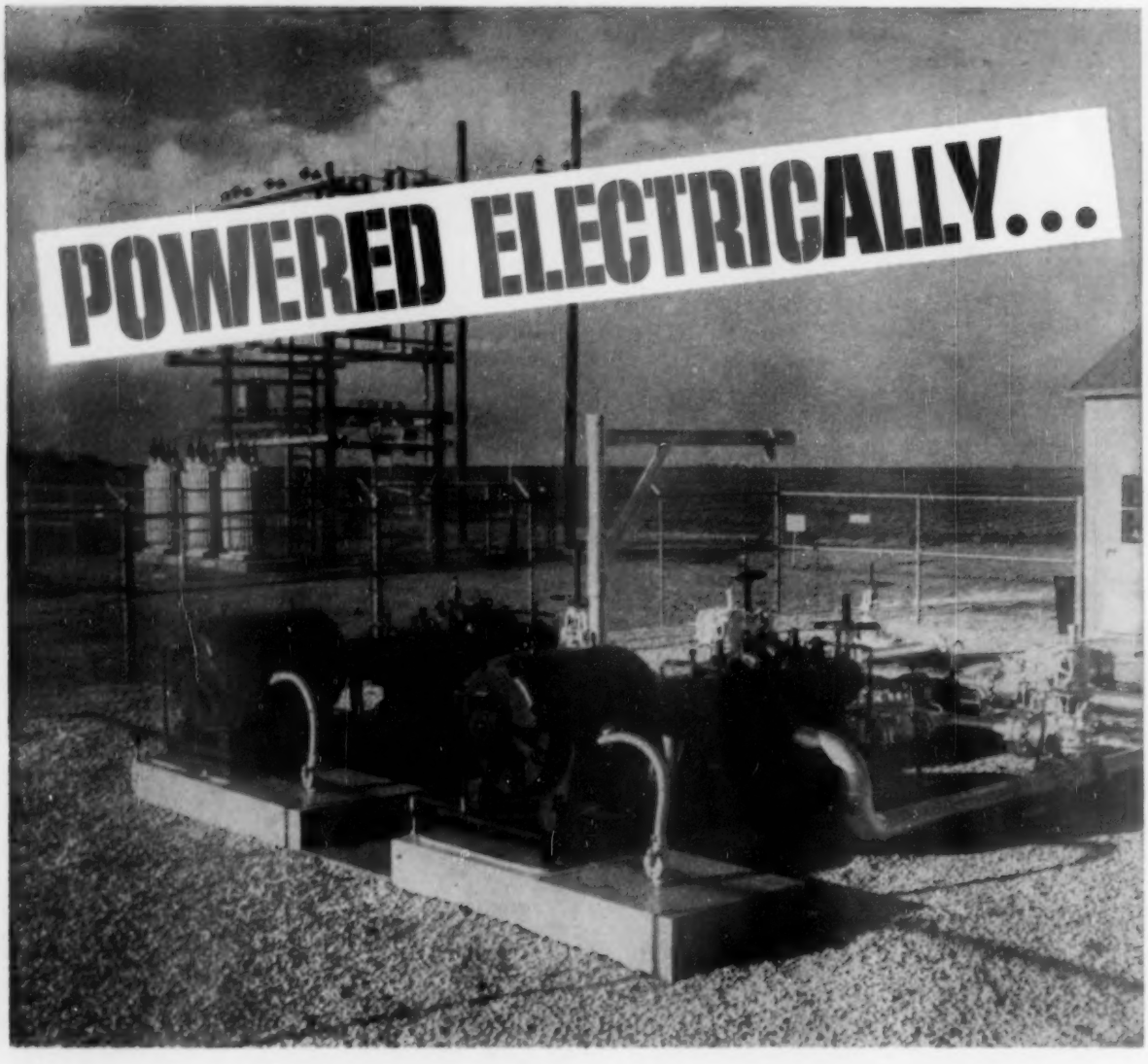
Products of Wickwire Spencer Steel Division • The Colorado Fuel and Iron Corporation

Abilene (Tex.) • Albuquerque • Amarillo • Atlanta • Billings • Boise • Boston • Buffalo • Butte • Casper • Chicago • Denver • Detroit • El Paso • Ft. Worth • Houston • Lincoln • Los Angeles New Orleans • New York • Oakland • Odessa • Oklahoma City • Philadelphia • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • Seattle • Spokane • Tulsa • Wichita

CANADIAN OFFICES AT: Toronto • Vancouver

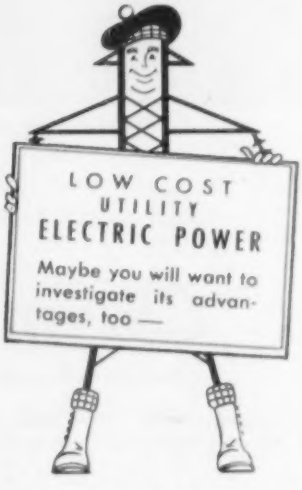
OTHER CLAYMONT PRODUCTS

Stainless-Clad Plates • Manhole Fittings and Covers • Large Diameter Welded Steel Pipe Flame Cut Steel Plate Shapes • Flanged and Dished Heads • Carbon and Alloy Steel Plates

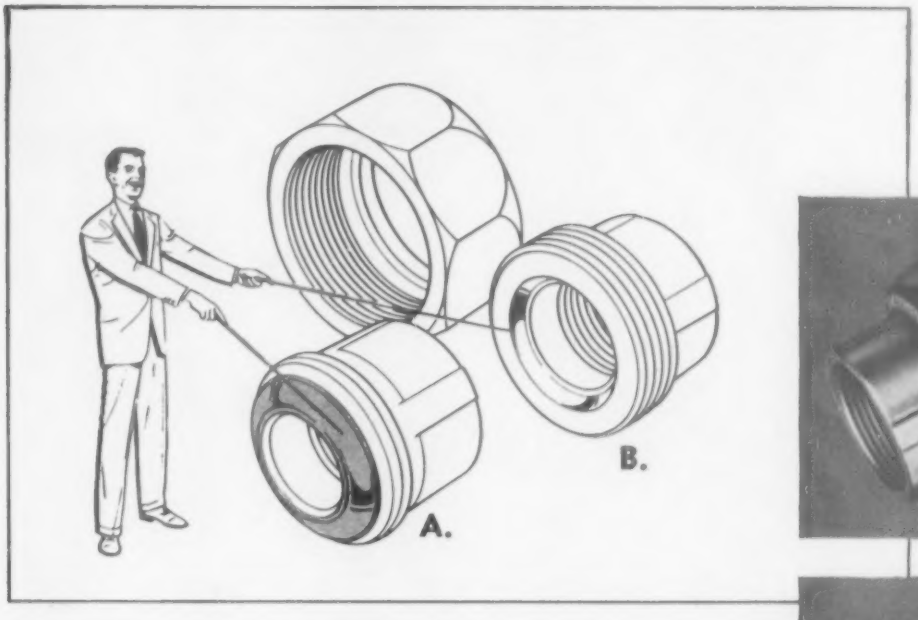


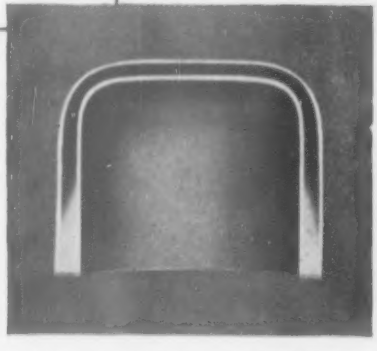
. . . There's a BIG DIFFERENCE!

Whenever Low Cost Utility Electric Power is on the job ... you'll readily see the difference. Electric Power offers the operator a cleaner power source with the added advantages of LESS MAINTENANCE, LESS ATTENTION, and LESS MANPOWER. Automatic Remote Controls also mean greater efficiency... plus a more economical operation. Be sure of power when and where you need it... but be sure its Low Cost Utility Electric Power.



WRITE PETROLEUM ELECTRIC POWER ASSOCIATION, P. O. BOX 2771, DALLAS, TEXAS, OR CALL THE SALES ENGINEER OF YOUR LOCAL UTILITY ELECTRIC POWER COMPANY — NOW





Because the male seat ("A" above) is 150 Brinnell harder than the female seat ("B")---

Rockwood unions will not gall in "making up"

Special engineering design and processing creates this hardness differential and the toughness you've been needing in replacement and new work. AISI Molychrome steel and *special* heat treating give the male seat its greater degree of hardness . . . preventing galling in "making up."

Exclusive Rockwood cold working process results in maximum resistance to expansion, shock, jar and vibration, thus insuring maximum long-life strength. Balanced design distributes this strength uniformly throughout.

You also get . . .

★ Seats double-locked under pressures of 100,000 and 400,000 lb.

★ Absolutely interchangeable parts for speedy replacements.

★ Plug type ball-to-cone design — no sharp corners — (eliminates scratching and damaging when making up in tight places).

★ "Rockwoodizing" protection of entire Union against corrosion.

Rockwood Unions are tested and listed by Underwriters' Laboratories, Inc. for use with flammable liquids and gases. Rockwood Steel Union #603 is the first to give such safety under pressure — and at great economy.

If you are not already using this new union, mail coupon today for full information.

In Processing Rockwood Cold Forged Steel Unions, cold working makes core fibers follow the shape of the union for best under-pressure performance. Creates a hard, high tensil, outer skin that will stand more abuse and has greater strength than any other union on the market.

ROCKWOOD SPRINKLER COMPANY

Worcester 5, Mass.

SEND FOR THIS INFORMATIVE BOOKLET

ROCKWOOD

ROCKWOOD SPRINKLER COMPANY
1443 Harlow Street
Worcester 5, Mass.

Please send me prices and further data on the new Rockwood Union #603. I would like the name of the nearest Rockwood distributor.

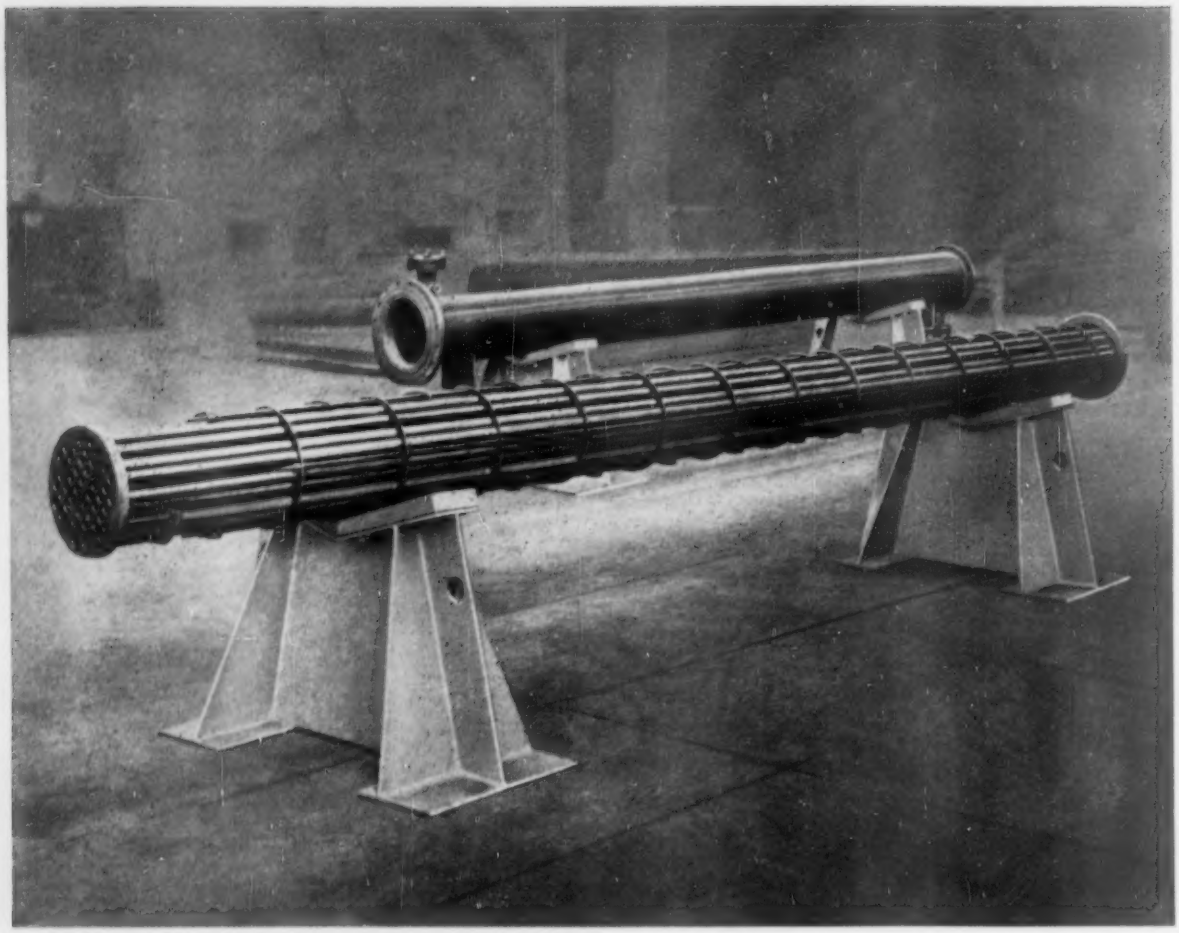
Name.....

Title.....

Company.....

Street..... City.....

Zone..... State.....



TITANIUM...Strongest Defense Against "All-Out" Attack

In the ceaseless battle against corrosion, B&W Seamless Titanium Tubing is providing a first and most powerful defense.

B&W Titanium Tubing is the practical result of many years of experience in making tubes of carbon steels, stainless steels, other alloys. It superbly combines maximum corrosion resistance and easy workability.

For example, the superior qualities of B&W Titanium Tubing made it the natural choice of Struthers Wells Corporation for fabricating the all-titanium heat exchanger shown above. This unit, now performing perfectly in service, is 12 ft. long, x 17½ inches diameter and weighs 2200 lbs.

This case, like many others, shows how B&W Seamless Titanium Tubing met the need and solved the problem for a fabricator.

Get answers to *your* questions on why to use . . . what to use . . . how to use titanium tubing . . . call on Mr. Tubes. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

Seamless and welded tubular products, seamless welding fittings and flanges—in carbon, alloy and stainless steels

A modern department store—oilfield style

A store is "any place where products are kept for sale"—but this doesn't fully describe a National Supply Store. Take the time for a complete tour of the one nearest you and you'll soon see why.

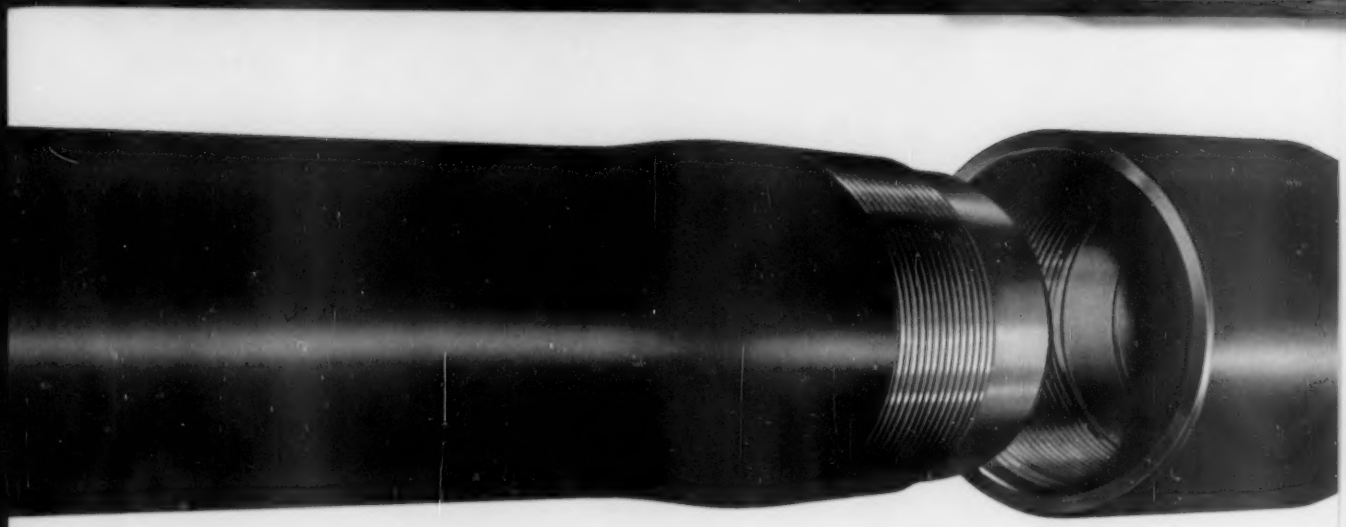
Even as you approach it, you'll notice the adjoining equipment yard. There beside the racks of famous SPANG tubular products, you'll see National pumping units, sucker rods and Ideal rig equipment. That's the heavy equipment department of a National Store.

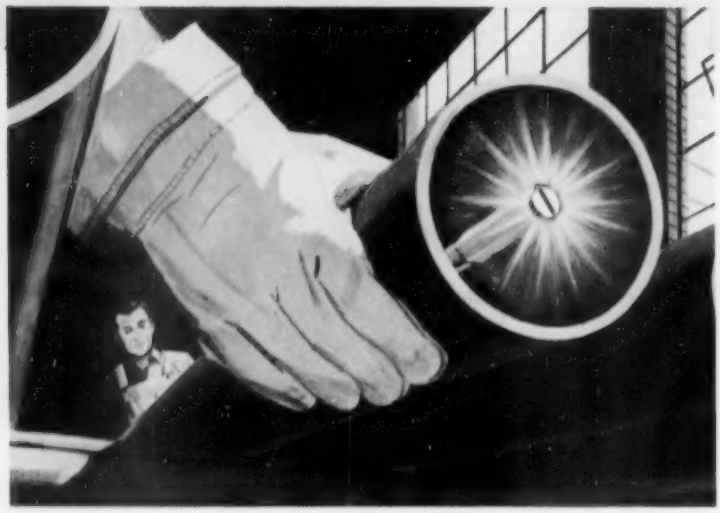
Walk in the back door, and you'll probably see National Supply personnel busily servicing a downwell pump. Most of these jobs are rush orders, and the pump service shop is an important department of a National Store.

A few steps to the front door, and now you're ready for the "general store" department. A colorful display of hand tools or paint may catch your eye first, but you'll get the complete picture as you look around. This store may carry a few thousand or many thousands of items, but one fact is clear: everything stocked here meets the operating needs of the surrounding field. This includes the many helpful product bulletins in the handy literature racks—the "information center" department of a National Store.

A general store, a heavy equipment yard, a service shop, an information center . . . these departments of a typical National Supply Store are organized in a compact, efficient service point for *all* your oilfield equipment needs. You owe it to yourself to see for yourself.

THE
NATIONAL SUPPLY
COMPANY





Tubing

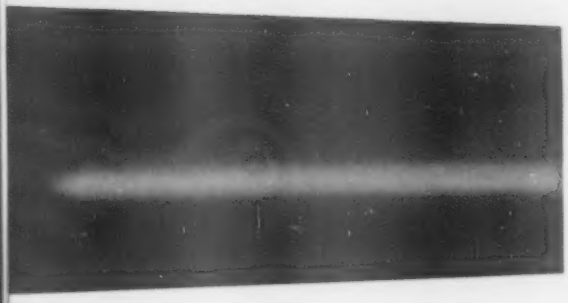
Specify SPANG Plastic Coating for maximum corrosion resistance!

After carefully-controlled shot-blasting and cleaning operations, a tough epoxy-phenolic internal surface coating is applied by alternate spraying and baking. A uniform thickness of not less than .005 inches is the result. Ask the National representative in your area about this service—and any other details you'd like to have about SPANG Tubing.

SPANG® EXTREME LINE TUBING

Particularly useful for producing deep wells and high pressure wells, this quality tubing—

- Provides maximum running speed; fast joint make-up
- Has 100% joint strength
- Provides 100% resistance to leakage
- Has 50% less connections
- Provides positive shoulder contact engagement
- Has a streamlined exterior
- Is available in grades J-55, N-80 and P-105 to suit every well condition



SPANGSEAL® TUBING

Field tests have proved that you'll minimize a host of common tubing troubles when you use Spangseal. This integral joint tubing—

- Has 50% less connections
- Provides 100% resistance to leakage
- Provides more hole clearance
- Eliminates "hanging-up" while running
- Is available in grades J-55, N-80 and P-105 to suit every well condition

you can trust . . . because it's

SPANG®

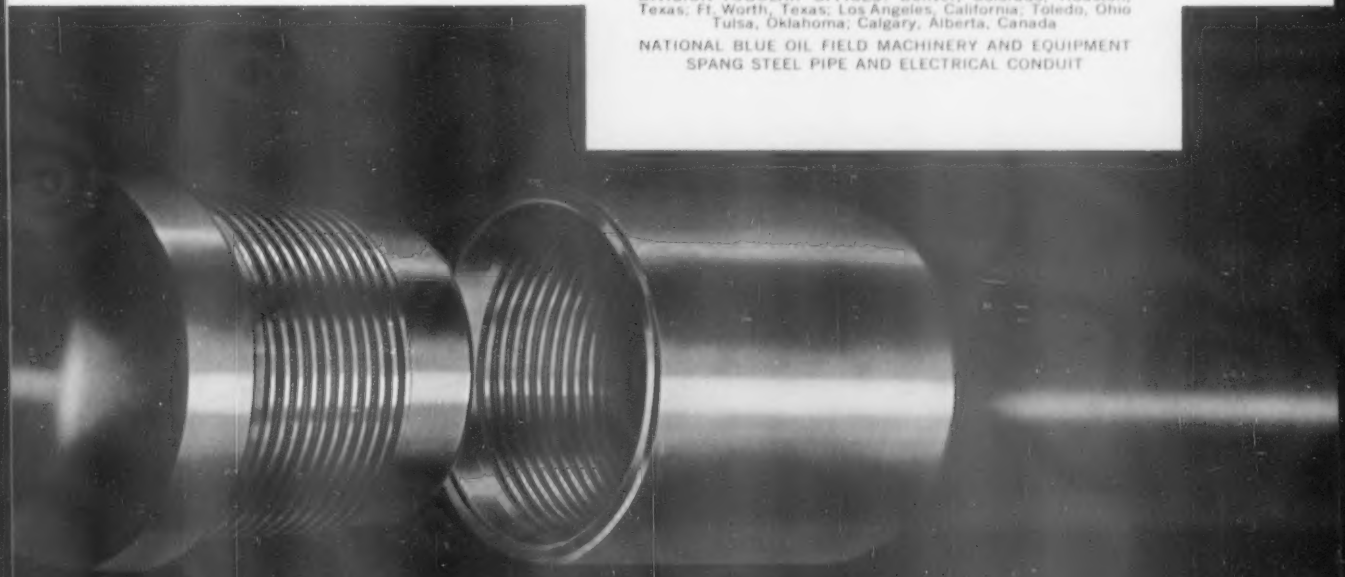
THE NATIONAL SUPPLY COMPANY

SPANG-CHALFANT DIVISION

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.

DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Ft. Worth, Texas; Los Angeles, California; Toledo, Ohio Tulsa, Oklahoma; Calgary, Alberta, Canada

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT



Another quality SPANG product on the next page . . .

The National Store

nearest you has this quality steel pipe!

SPANG CW Steel Pipe is available at every National Supply Store in a full range of sizes—and, most important, there's no extra cost for its special quality.

In countless oilfield applications, SPANG CW has consistently proved itself for dependable general service work. That's because it's made under close quality control conditions—like all the other famous SPANG oil field tubular products. The manufacturing care behind SPANG CW makes it easy to work with and install. Thorough tests and inspections before shipping insure its top strength and long service life—features that pay off wherever you put it to work.

SPANG CW is especially useful for water-flooding, air, gas and salt water disposal lines, water and oil gathering systems.

Try it on your next job.

THE
NATIONAL SUPPLY
COMPANY

SPANG-CHALFANT DIVISION
MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Ft. Worth, Texas; Los Angeles, California; Toledo, Ohio Tulsa, Oklahoma; Calgary, Alberta, Canada
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

NON-SPIN
Can't spin because centrifugal force is neutralized by the offset in the barrel of the gun. Perforated flanges and locking pins permit locking the gun in any desired position.

BOTTOM TYPE
Designed for use where large size metal tanks are employed as mud pits. Simple construction. Easy to install and operate.

SPINNER TYPE
Designed for use where constant agitation is desired. The nozzles are set at an angle and the pressure in the line imparts a spinning motion. This is accommodated by a Style 20 Chiksan High Pressure Swivel Joint. Furnished in any desired length.

Blend it Best—Keep it Right with
CHIKSAN MUD GUNS—

Insure your drilling operation for complete safety, flexibility and economy by specifying CHIKSAN mud mixing guns. CHIKSAN guns maintain the emulsion in proper solution . . . keep chemical additives and basic weight materials in balance for most effective drilling. A constant suspension of mud, chemicals and water is assured when you use CHIKSAN mud guns.

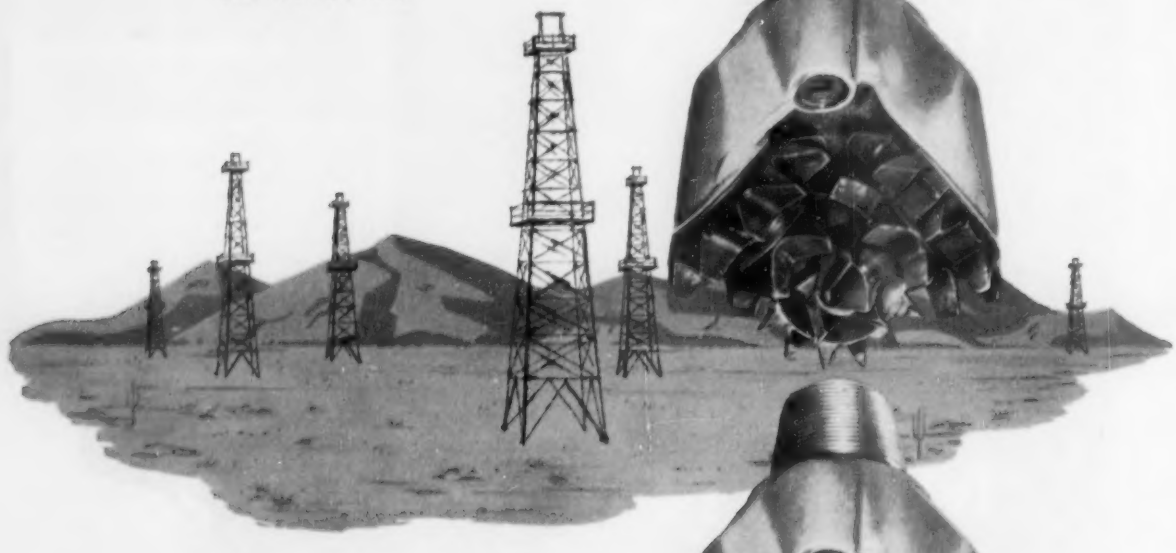
CHIKSAN

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION fmc

CHIKSAN COMPANY, Brea, California • Chicago 3, Illinois • Newark 2, New Jersey • Well Equipment Mfg. Corp., (Division) Houston 7, Texas • Chiksan Export Co., Brea, California; Newark 2, New Jersey • Chiksan of Canada, Ltd., Edmonton, Alta.

Do you require lightweight, fast rotation drilling for crooked hole country . . .? Or – do you need deep penetrating action for the softer formations? Whatever your specific requirements – there's a CP Bit for your exact needs! Chicago Pneumatic's complete line of Three Cone Rock Bits and Jet Bits includes seven different types for all kinds of formations from soft to exceedingly hard and abrasive.

Oil Tool Division,
Chicago Pneumatic Tool Co.,
5000 U. S. Highway 81 South,
Fort Worth, Texas.



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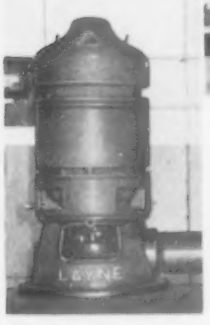

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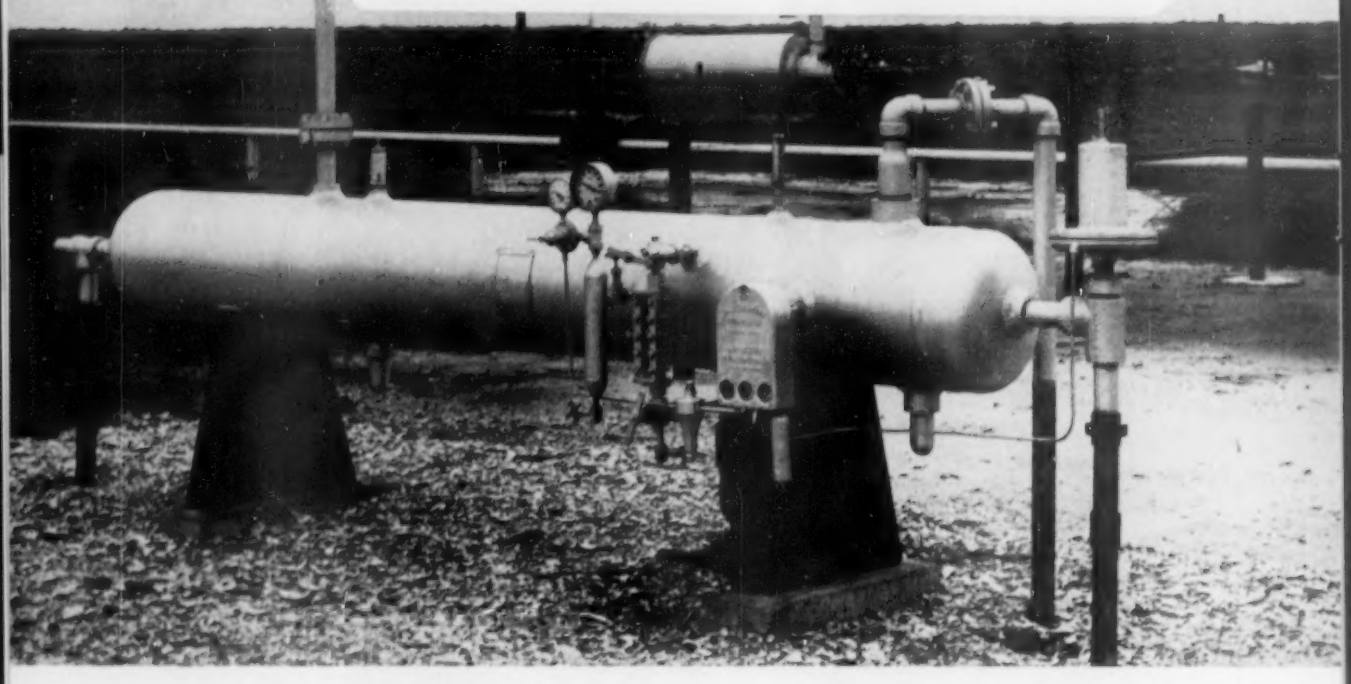

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They Say—

Where Does the Independent Stand?

Dear Sir:

The independent oil operator, along with the major oil company, is faced with the continuing serious problem of just staying in business. Where the discovery rate each year of some 70 per cent of new oil has been attributable to the activity and individual initiative of the American independent operator in the past, the future of continuing such a record is definitely pessimistic.

Where, in the past there was a gray zone that separated the independent operator and the major company, in their varying degrees of bigness, there is today a growing tendency for the independent operator to become smaller and the major company to become larger. The annual merging of independent operators and companies is strictly a fight for survival, and a protest against a creeping paralysis of government control, a penalizing tax system, and an inflated economy.

Henry Carter Rea, Denver, is an independent consulting geologist specializing in economics of petroleum geology and politico-economics of petroleum geology in foreign countries. He is a graduate of the University of California. Rea's assignments in exploration geology, starting in California, have taken him to every major oil province in North America, and to Java, Borneo, Afghanistan, Pakistan, India, Baluchistan, Italy and Holland.

Some of the factors that have had a marked tendency to depress the exploration drilling curve in the past 10 years are listed, not necessarily in chronological order:

... The raising of the cost of federal oil and gas leases from $32 per application to 25 cents per acre.

... The raising of the base rental on federal oil and gas leases from 25 cents to 50 cents per acre, payable in advance.

... The Internal Revenue's ruling that advanced lease rentals on federal leases had to be capitalized and could not be charged off as regular rentals.

... A confiscatory tax system that prevented the building up of working capital.

... The Internal Revenue's ruling that drilling costs could be classed as intangibles and charged off.

... The drop of 11 per cent in the drilling of wells for gas last year because of federal regulation of the gas industry.

... The veto of the Harris-Fullbright gas bill.

... The constant threat of a reduction in percentage depletion.

... The continuing high operating cost for labor and materials in exploration and development.

... The lack of outlets in the Rocky Mountain region.

... An over-emphasis on geophysics as a discovery tool.

... The imports of crude oil to make up for the oil we cannot afford to find because of the above factors.

The Rocky Mountain region, plagued by a lack of outlets and markets, still remains one of our great untapped potential sources of future reserves. However, these and other regions in the United States cannot be considered today, particularly by the traditional oil-finder, the independent operator, because of the economics involved.

And all of the complaining and agitating against imports of foreign crude will not alter the economic picture.

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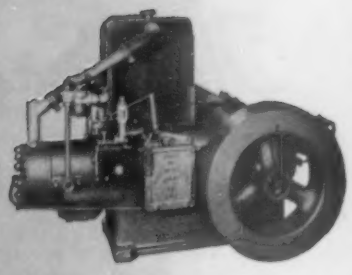

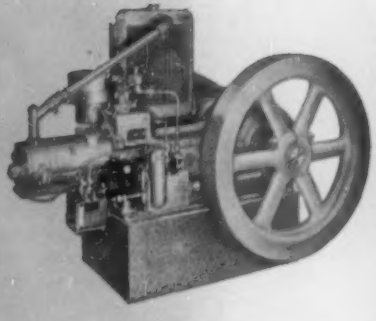

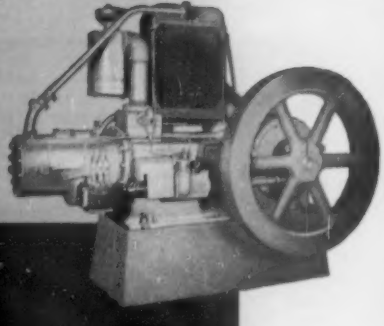

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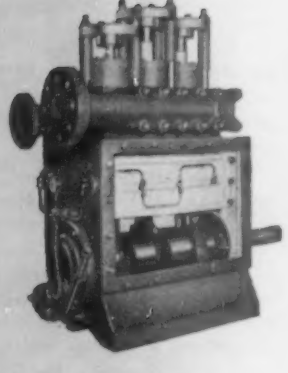

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Federal controls or legislation to control or stop imports will not alleviate the economic circumstances.

To further emphasize the plight of the Rocky Mountain region today and point up the lack of outlets, the question is: Who but a major company that is interested in finding reserves for the future wants another Williston basin? Or a Paradox basin of the Four Corners area?

The Williston basin with an average daily production of some 40,000 bbl., in a sparsely settled region, would have to have a sustained production, proven, of some 100,000 bbl. to warrant the cost of a pipeline to, say, the industrial area of the Twin Cities. The lack of outlets for the Paradox basin area is even more critical and has already shown its effects by curtailing development of several new fields in southeastern Utah. Again we come to the problem of economics and not geology, and a cutback on imports would have no effect on the future development of the Rocky Mountain basins.

Earlier optimistic expectations of the prolificacy of the Rocky Mountain province did not materialize. High risks accompanied by high costs with low returns had their effects. How long will the present cycle of decline in exploration in the Rocky Mountain region last? This question can be readily answered—when the economic conditions are sufficiently favorable to show a profit for the risks involved.

Henry Carter Rea
Petroleum Consultant
Denver.

"Tax Advantage" Incorrect

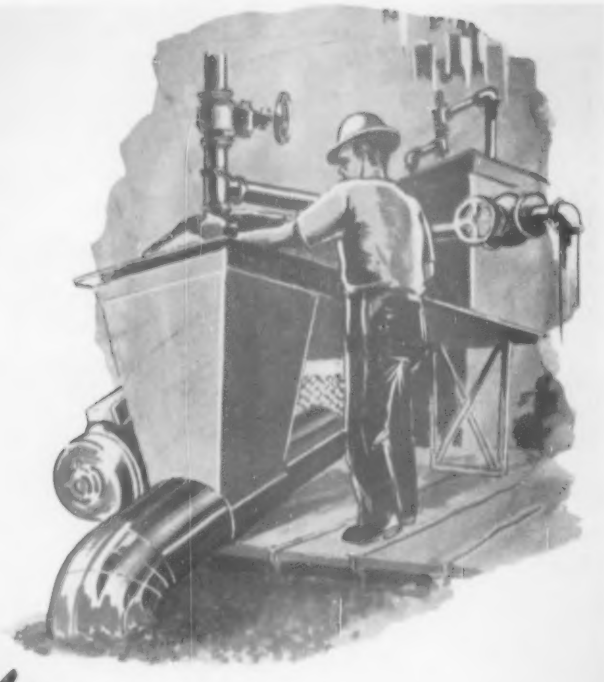
Dear Sir:

I was interested in your editorial page "A Glance Ahead" on July 16 and your reference to the recent sale of Premier Oil Refining Co. The reference is essentially correct except for the last phrase, "they lost their tax advantage."

You may be interested in knowing that Premier Oil Refining Co. was not a cooperative and has never been operated as such. Moreover, about half the cooperative organizations in the United States do not avail themselves of federal income tax exemption rights because of the highly restrictive requirements that go with exemption.

Illinois Farm Supply Co. is organized as a cooperative, but we consider the disadvantages of tax exemption greater than the advantages and as a result, we have been unwilling to qualify for an exemption. We pay federal income tax under the same regulations as any other corporation.

The owners of Premier, of which Illinois Farm Supply Co. was one, disposed of it because it no longer served their



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markets. The capital tied up in this enterprise could be used more productively elsewhere, and taxes had nothing to do with it whatever in any respect.

C. H. Becker
General Manager
Illinois Farm Supply Co.
Chicago.

CALENDAR

AUGUST

17 Southern Gas Association, pipeline operations and maintenance round-table conference, Hilton Hotel, El Paso, Tex.

20-21 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.

23-25 Alberta Society of Petroleum Geologists, sixth annual field conference, Canmore-Kananaskis region, Alberta.

27-29 Sixteenth Annual Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

SEPTEMBER

5-7 Wyoming Geological Association, eleventh annual field conference, Jackson Lake Lodge, Moran, Wyo.

7-8 Association of Desk and Derrick Clubs of North America, annual convention, Roosevelt Hotel, New Orleans.

9-12 American Institute of Chemical Engineers, William Penn Hotel, Pittsburgh.

9-12 Independent Natural Gas Association of America, annual membership meeting, St. Anthony Hotel, San Antonio, Tex.

11-13 Pacific Coast Gas Association, annual meeting, Hotel del Coronado, Coronado, Calif.

12-14 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

16-18 New Mexico Petroleum Industries Committee, annual convention, Hilton Hotel, Albuquerque.

16-21 American Chemical Society, 130th annual meeting, Atlantic City, N. J.

19-21 Southeastern Gas Association, Hotel Sir Walter, Raleigh, N. C.

16-21 American Society for Testing Materials, second Pacific area national meeting, Statler Hotel, Los Angeles.

17-21 Instrument Society of America, eleventh annual international instrument-automation conference and exhibit, New Coliseum, New York.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

20-21 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual membership meeting, Roosevelt Hotel, New Orleans.

20-22 Oklahoma City Geological Society, field conference, Guymon, Okla.

24-26 American Society of Mechanical Engineers, petroleum mechanical engineering conference, annual meeting, Statler-Hilton Hotel, Dallas.

26-28 Rocky Mountain Mineral conference, American Institute of Mining, Metallurgical & Petroleum Engineers, Newhouse Hotel, Salt Lake City.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

OCTOBER

2-3 Texas Mid-Continent Oil and Gas

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Members of the Dow technical team are Ben Hofmeyer, with the slide rule, and (clockwise) Bill Pearce, Dick Wing, Gil McClennan, John Arnold and Herm Scholten.

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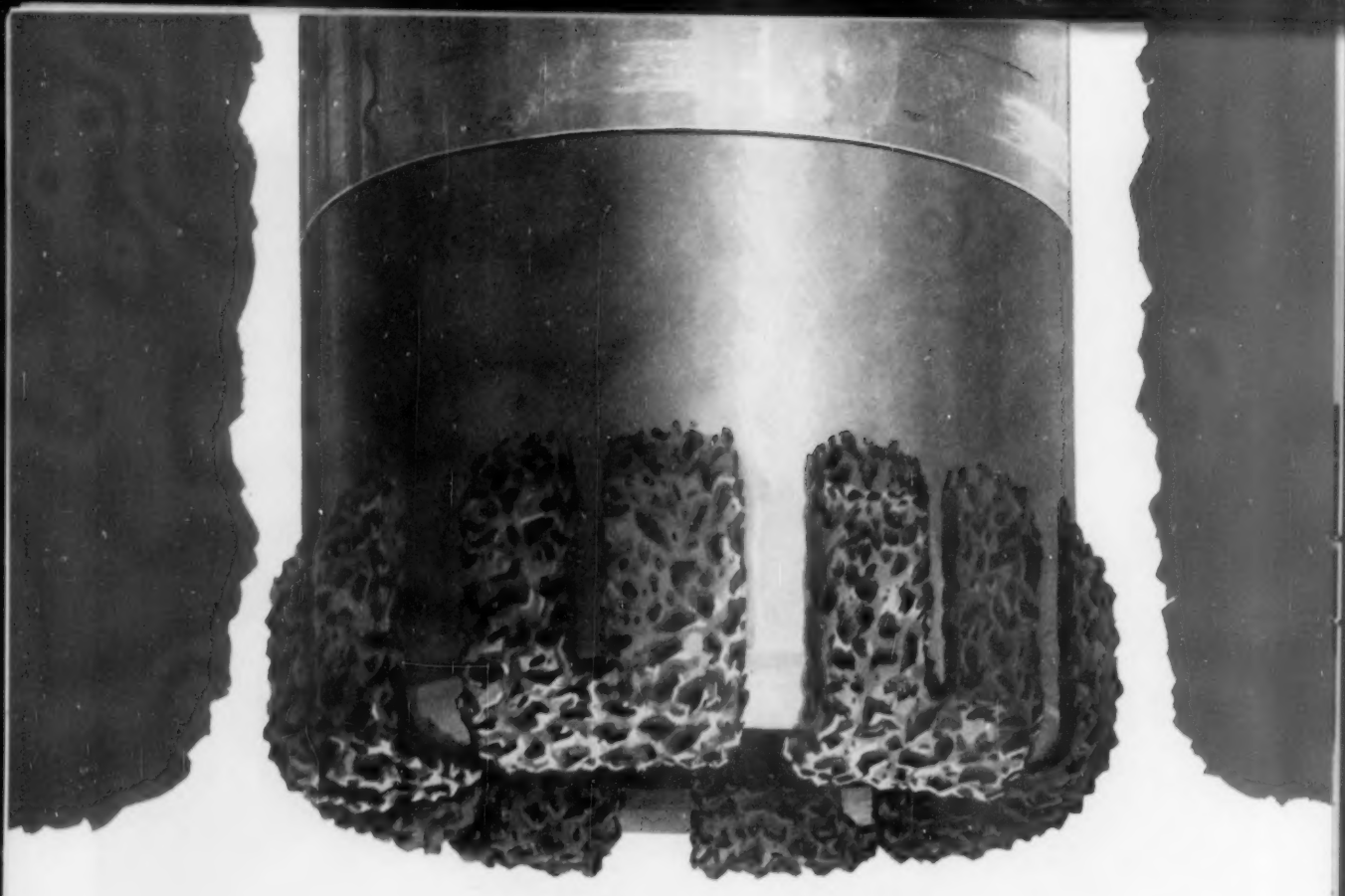

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Association, thirty-seventh annual meeting, Rice Hotel, Houston.

7-9 American Association of Oil Well Drilling Contractors, annual meeting, Texas Hotel, Fort Worth.

9-10 Southwest Kansas Petroleum Industry and University of Kansas, fourth annual two-day gas measurement institute, Liberal, Kan.

10-12 International Geological Symposium of the Williston Basin, Bismarck, N. D.

11-12 California Natural Gasoline Association, fall meeting, Sheraton Huntington Hotel, Pasadena, Calif.

14-17 American Institute of Mining, Metallurgical & Petroleum Engineers, Petroleum Branch, fall meeting, Biltmore Hotel, Los Angeles.

14-20 OIL PROGRESS WEEK.

15-17 American Gas Association, annual meeting, Atlantic City, N. J.

18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

18-21 Permian Basin Oil Show, Odessa, Tex.

22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

23-26 National Association of Corrosion Engineers, south central region, Beaumont, Tex.

26 Natural Gasoline Association of America, southern regional meeting, Captain Shreve and Washington-Youree Hotels, Shreveport.

26 American Institute of Chemical Engineers, South Texas Section, eleventh annual technical meeting, Galvez Hotel, Galveston, Tex.

29-30 Illinois Geological Survey, Petroleum Engineering Conference on Waterflooding, University of Illinois, Urbana, Ill.

29-30 Independent Petroleum Association of America, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.

29-Nov. 1 Society of Exploration Geophysicists, annual meeting, Roosevelt Hotel, New Orleans.

31-Nov. 2 Gulf Coast Association of Geological Societies, sixth annual convention, Plaza Hotel, San Antonio.

NOVEMBER

1-2 Louisiana Polytechnic Institute, fifth annual instrumentation conference, Ruston, La.

7-8 Instrument Society of America, Philadelphia Section, symposium on process data logging, Stratford Hotel, Philadelphia.

8-9 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast Joint Regional Meeting, Ambassador Hotel, Los Angeles.

8-9 Society of Automotive Engineers, Inc., national fuel and lubricants meeting, Mayo Hotel, Tulsa.

12-15 American Petroleum Institute, thirty-sixth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.

25-30 American Society of Mechanical Engineers, Statler Hotel, New York.

30 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.

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JOURNALLY SPEAKING . . .

Oil, Weather or Not

WE react with mixed emotions to the announcement that the American Petroleum Institute is going to concern itself with the weather.

It's about time, we would say, since everybody else has been concerned with the weather for quite some time. Everybody except Los Angeles, that is. They don't have weather there; they have smog instead. But from what we have heard of smog, we'd just as soon have weather.

Now the A.P.I. isn't going to try to do anything to affect the weather. This is smart. Think of all the trouble it would get into. Some people always complain about the weather, no matter what it is. And if they had the slightest grounds for suspecting that the oil people had anything to do with it they would blame the "oil monopoly" every time a pasture dried up or a corn field started aching. There would probably be a congressional investigation of the oil industry after every hail storm. The oil industry gets blamed for enough things it didn't do without taking on responsibility for the weather.

What the A.P.I. plans is to find out in advance what the weather is going to do to it. It's getting interested in long-range forecasting. The subject will be taken up at the annual A.P.I. meeting in Chicago next November, and we can't think of a better time or place. Chicago always trots out some samples of unusual weather for the A.P.I. We particularly recall one year when the snow shot horizontally past the hotel windows for four straight days, and the police had to string ropes to keep people from being blown off the sidewalk. Nobody left the hotel except to attend the most important cocktail parties. The A.P.I. could well start by forecasting the weather at its meetings, so the delegates would know what to wear.

What A.P.I. wants to do is to lend a hand to research projects aimed at developing better means of forecasting what the weather is going to be like, on the theory that this will assist oil men to prepare for what is coming and to act accordingly.

Now isn't that pretty silly? We don't mean the forecasting part. We're all for that. A lot of work is being done on the subject, and the oil industry ought to contribute money and brainpower to the cause.

The silly part is the expectation that oil men will pay any attention to a forecast of any kind. Oil men have been thumbing their noses at forecasts for so long that it's become a habit. They got that way three generations ago by ignoring such forecasts as that the United States would be out of oil by 1900; that no oil would be found west of the Mississippi; that Texas had no oil structures; that a man could drink all the oil that would be found in West Texas; and many more like that.

And getting down to more recent times and back to the subject of weather, almost everybody, except oil men, have become more or less aware that after winter comes spring, and that spring is warmer than winter and also too rainy for much plowing or picnicking. So it has sometimes been forecast that people will use less heating oil and gasoline in the spring. But the oil industry doesn't have much truck with such forecasts. It keeps on producing, importing, and refining at a great clip until oil is slopping over everywhere, and then it wonders what happened.

We sort of doubt that oil men will pay any more attention to an A.P.I. forecast that spring is coming than they ever have paid to the forecasts of the Old Farmers' Almanac.

The oil industry has had quite a bit of experience in making long-range forecasts of various sorts—demand, for instance. In fact, it is much better at making them than at following them. For example, it forecast that its customers would buy about 5 per cent more oil the first half of this year—which they did. But did the industry believe its own forecast? Certainly not. It turned out a lot more oil than that, and now it can't find any place to put it.

Somehow we can't help but feel that the A.P.I. is tackling this forecasting problem from the wrong end. The oil industry doesn't need a bigger supply of forecasts. It needs to increase the consumption of those it has already.

—*Henry D. Ralph.*

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U. S. oil's real stake in the Suez crisis

EGYPT'S seizure of the Suez Canal is a serious matter for the American oil industry, though not in the way that was assumed by some news commentators in their early discussion of the event.

Oil is an innocent bystander in this crisis, caught in the conflict of international power politics which it had no part in making. There are no charges of improper or unsatisfactory conduct by any oil company. The issues do not involve ownership of oil nor its destination, price, concession terms, or operating methods.

The fight isn't over oil, but American oil companies in the Middle East are vitally concerned with the outcome for two reasons. First, they are big users of the canal, and even those that don't ship oil through it get supplies via this waterway. Second, the fate of their huge investments in other Arab regions may hinge on the outcome of the Suez crisis.

THE UNITED STATES COULD get along very nicely without the oil imports brought in through Suez—something like 175,000 bbl. per day. If this were all there is to it, the possibility of closing the canal could be viewed with equanimity by all in the American oil industry except the stockholders of those companies using Suez.

But there are far more serious implications. All Europe would suffer severely and immediately from loss of Suez oil traffic. There would be a scramble for oil from other sources and a reshuffling of the supply and distribution pattern of the entire world. The effects on the U.S. oil industry would be much greater than those flowing from Iran's nationalization of its wholly British-owned oil industry in 1951.

And it should not be assumed that production from Middle East fields and operation of the big pipelines to the Eastern Mediterranean would continue smoothly with Suez closed. Should these supplies be cut off by action of other Arab nations in support of Egypt—or by war—the disturbance within the oil industry in the United States would be incalculable.

THE STAKE, THEN, of American oil in the Suez crisis is not the volume of oil that comes here via the canal. It lies in collateral effects and future developments as they give answers to such questions as:

- Will this encourage expropriation of American oil operations elsewhere in the Middle East?
- Will it disrupt the delicate world-wide balance of oil supply and demand, creating severe shortages, violent price changes, and hurried rearrangement of transportation facilities in many places?
- How much reliance should the United States place on foreign oil from tinder-box areas in an unstable world when desperate power politics displaces the principles of law and equity on which American business is based?

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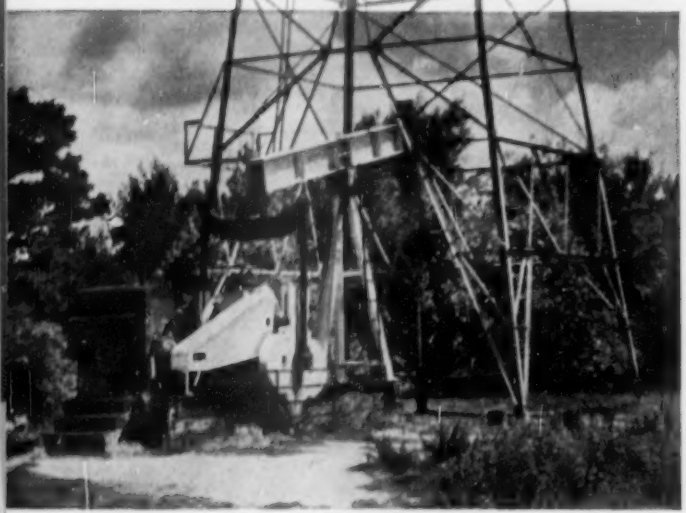

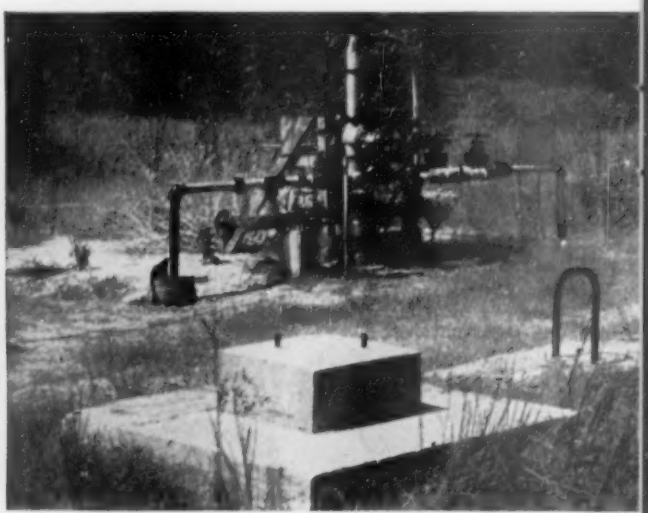

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Current and significant in . . .

The Industry This Week

Pipelining

• **Trans-Canada apparently is fighting a losing battle** to complete the Alberta-Winnipeg section by the scheduled deadline. But contrary to first reports, this will not legally jeopardize the pipeline. P. 98.

New coal-slurry line has been completed in Ohio by Williams Brothers. It required unusually deep cuts in ditching to prevent grades from exceeding 10°. P. 90.

First gas from Wyoming's Big Piney field in 18 years has begun flowing to market over a newly completed lateral of the Pacific Northwest system. P. 97.

Industry

• **Crude price cuts have spread** to Texas Panhandle and southern Oklahoma fields. Producers fear other areas may be hit next, possibly the Gulf Coast or South Texas. P. 92.

Rising cries for nationalization of oil in the Middle East now have international oil interests more worried than current crisis over Suez. P. 101.

Group of 19 oil-industry trade associations has petitioned ODM Director Flemming to take direct action to halt rising flow of foreign oil into U.S. P. 85.

Leaders of offshore oil companies have moved into Washington to act as mediators in U.S.-Louisiana boundary deadlock which threatens to disrupt the industry. P. 80.

Oil industry is getting its new steel prices. That $8.50 a ton boost in basic price of steel will cost oil in excess of $75 million a year. P. 86.

Production

• **Van Woodbine reservoir** in East Texas, already 27 years old, now is expected to keep producing for another half century. It's the first major field ever unitized and its story proves financial wisdom of keeping modern. P. 82.

Humble plans to drop hand-gaging of oil and switch to positive-displacement meters in Anahuac field on Texas Gulf Coast. P. 81.

Colorado is setting precedent in fixing allowables for Adena field. For the first time it used oil in place under individual leases as basis for allocating production. P. 100.

Exploration

• **Chinese Communists** say a big, new oil field is developing in northwest China and promises to be biggest in country. It's Karamai field extending over thousands of square kilometers of desert in the Tzungaria basin of northern Sinkiang. P. 103.

Indiana Standard now plans to organize a Venezuelan subsidiary to seek concession in an area where it once held important acreage. P. 102.

Refining

• **Miniature atomic refinery** has been created by Atlantic Refining scientists to test effects of radiation on petroleum conversions. P. 95.

Independent refiners object to proposed sale of Universal Oil Products Co. They claim U.O.P. technology has enabled the little refiner to remain competitive. P. 84.

SIDEBOOM TRACTORS position welded string of pipe for cleaning and priming prior to coating and wrapping to prevent corrosion. Steady progress shows how . . .

Trans-Canada Pipeline Defies Obstacles

Paul Reed
Pipeline Editor

CALGARY. — Trans-Canada pipeline is fighting an uphill battle in its attempt to complete the Alberta-Winnipeg section on schedule this year.

With cold weather 2 months away and pipe shipments delayed by the steel strike, it now appears unlikely that Trans-Canada Pipe Lines, Ltd., can meet the original government deadline. But hazards for the entire 2,250-mile project to bring Alberta gas all the way to Montreal are not so great as they may seem:

. . . **It is not jeopardized** legally by the delay, as has been reported.

. . . **Financing is assured** for paying the $80,000,000 note, bearing 5 per cent interest, coming due next spring.

. . . **Sufficient gas** is available to supply the 200,000,000 cu. ft. daily contracted for Midwestern Gas Transmission Co.'s projected line from Emerson, Man., to Nashville, Tenn., now before the Federal Power Commission.

Some plans have been changed. Others are changing and still more changes are to come. But in spite of all obstacles, the program goes steadily ahead.

Both construction spreads now in full operation are laying pipe at the rate of more than a mile and a half a day with the 125 miles of 34-in. now available. But any additional pipe laying in 1956 will depend on whether production of pipe mills can be rescheduled to accelerate deliveries. Schedules were upset by the steel strike in the U. S., the source of all pipe for the 574-mile western section of the line.

While the strike has set back construction, the legal status of Trans-Canada is not affected. It does not face the threat of forfeiture to the government for failing to get to Winnipeg this year. By legal recognition of the existence of "force majeure" incident to the steel strike, the obligation to carry the line to Winnipeg this year is suspended.

Gas supply, market . . . On the other hand, each advance in Trans-Canada's efforts to lay the world's longest pipeline stimulates gas sales that result in more contracts in eastern markets.

The market which is potentially available to Trans-Canada Pipe Lines contains a population of approximately 4,000,000 and a degree of industrialization that is above average for the North American Continent. A large part of the industrial market for natural gas is for processing applications as differentiated from boiler fuel.

Approximately 65 per cent of the market is located in eastern Canada with the heaviest load concentrations in the heavily populated and highly industrialized areas of Montreal-Toronto and Southwest Ontario.

Firm 20-year contracts have been signed calling for a total maximum daily delivery of more than 600,000,000 cu. ft. in the fifth full year of operation of the Trans-Canada system. This includes a contract for 200,000,000 cu. ft. per day with the Midwestern Gas Transmission for distribution in the United States.

It is confidently expected that additional contracts with smaller distributors will be signed in the next few months for another 100,000,000 cu. ft. of fifth year maximum day delivery.

Trans-Canada believes that contract volumes are conservative and that 2 or 3 years of actual experience with natural gas coupled with the booming rate of growth of the Canadian economy will result in actual sales substantially in excess of the now contracted quantities.

Sales contracts in Ontario spurted after the June 7 financing act of the Canadian Government. This started talk that the market in eastern Canada would be so big that Trans-Canada

might not have sufficient capacity to supply the Midwestern line. However, there is plenty of gas in Alberta seeking an export market. The province has authorized export by Trans-Canada of up to 620,000,000 cu. ft. daily, or 4.35 trillion cubic feet for 25 years.

Trans-Canada was designed to take 500,000,000 cu. ft. daily from Alberta. But it can be assumed that necessary changes in throughput could be provided readily to meet market demand.

Bindloss field alone will supply initial requirements for the Winnipeg section. The Winnipeg gas market is still small in comparison with Calgary because of its late development. Only a fraction of the Winnipeg market is served by natural gas. By contrast, Calgary, a city almost half the size of Winnipeg, has depended almost entirely on natural gas for a long time. It is now thoroughly connected by its distribution system.

Greater Winnipeg (population 354,069 in 1951) had only 15,427 connections in 1954 when maximum delivery was 3,100,000 cu. ft. daily.

THIRTY-FOUR-INCH PIPE is moved by a boom tractor for a Swift Current River crossing in Saskatchewan on Trans-Canada line.

Financing . . . Even if the line is not taken to Winnipeg this year, it is expected that financing will be completed adequately for paying off the $80,000,000 note which provided 90 per cent of the construction cost.

This $80,000,000 came out of a government fund of $118,000,000 appropriated for Northern Ontario Pipe Line Crown Corp. for building the section across Ontario. Hence this sum will be returned to the fund and will be available for paying the construction of the 675-mile line across Ontario to Toronto. Estimated cost of this "uneconomic" leg is $118,000,000 and latest figure for the entire line is $378,000,000.

For the financing of Trans-Canada, it is expected that stock for 51 per cent of the junior financing will be offered for purchase entirely through Canadian financial firms—perhaps late in the fall. Junior financing as a whole will amount to 25 per cent or more of the total financing of Trans-Canada.

New plans . . . Construction plans east of Manitoba have been reshuffled. Here are the new plans:

. . . The Toronto - Montreal section contemplated earlier for 1956 construction will be deferred until 1957.

Through this line, gas from the United States will build up the Montreal market if FPC permission is granted. After Trans-Canada is extended to Montreal, excess gas would be exported from Canada via Toronto to the United States.

. . . On the northern Ontario link, Northern Ontario Pipe Line will probably build the western section as far as practicable next year.

Initial gas . . . Gas for initial requirements of the first leg of Trans-Canada will be moved from Bindloss field in Alberta through a 34-mile line (18 miles of 34-in. and 16 miles of 18-in.) to be built by Alberta Gas Trunk Line Co., Ltd.

Alberta Gas Trunk Line would not be expected to schedule construction of the 34-in. link from Bindloss until Trans-Canada learns when pipe will come for completing the line to Winnipeg.

At first there will be no compressor stations because field pressure at Bindloss is enough to flow early gas requirements to Winnipeg.

Construction pace . . . The two construction spreads in the field in western Saskatchewan are laying 34-in. as fast as smaller big-inch pipe is being laid elsewhere in the industry. Both spreads have equipment that is new this year.

Canadian Bechtel, Ltd., the first contractor in the field, has a double jointing yard at Morse, Sask., using submerged arc, semiautomatic welding for joining 40-ft. joints to make 80-ft. joints for delivery to the right-of-way. Bechtel's pipe laying started in the middle of July in the vicinity of Morse. On August 1, the first day of laying long joints, the Bechtel spread welded 9,500 ft.

The spread of Majestic Contractors, Ltd., was in full swing early this month laying pipe from the upstream end of the Trans-Canada system near Burstall. Work started at the future junction between Trans-Canada and Alberta Gas Trunk Line just inside Alberta. On August 5, Majestic welded 8,000 ft. with 40-ft. joints.

The four contracts awarded cover about 100 miles each. Dutton-Williams Bros., Ltd., and Mannix, Ltd., also have spreads. But because of the pipe shortage only Majestic and Canadian Bechtel have started. Three more contracts are to be let to take the line into Winnipeg.

Terrain, route . . . Pipe is now being laid between Moose Jaw, Sask., and Medicine Hat, Alta.

The rolling prairie is dotted by numerous lakes and ponds.

From Burstall to Manitoba the terrain is much the same—rolling hills of some grazing land but mostly cultivated ground. There are few streams. In western Manitoba the land becomes flatter and has more scattered boulders.

In western Ontario, around Kenora, the terrain is choppy to rough calling for 70 per cent rock ditch. From there the route goes through rolling terrain, grasslands with light muskeg, swamps, and water with 50 per cent rock ditch, to 35 miles of solid rock ditch, in an area where 60 per cent of the ditch requires some rock excavation near Port Arthur.

The entire section from the Ontario-Manitoba border to Kapuskasing, Ont., is pre-Cambrian shield rock with thin soil, timber, and numerous lakes.

Oil Men Enter Dispute

Offshore operators try their hand as mediators in the U. S.-Louisiana tiff, warn all rigs may quit work soon

WASHINGTON.—Offshore oil operators, alarmed over a growing number of idle rigs and the threat of expiring leases, have stepped into the role of arbitrators in the U.S.-Louisiana tidelands dispute.

At midweek, representatives appointed by interested companies were pressing hard to uncover a basis on which a quick agreement could be reached.

In effect, they are attempting to strip the lingering controversy of all but the basic considerations. If state and federal authorities will agree on two or three questions, they feel, an interim settlement could be mapped and remaining points of contention could be negotiated later.

This would permit new drilling starts to be made immediately within the disputed area, which takes in all land between the 3-mile and 3-league limits off Louisiana's shoreline. The state claims the farther boundary marks its limits of jurisdiction.

The U. S. Supreme Court imposed an injunction last June on new drilling starts after being asked to rule on the issue. The court will hear the case next fall.

J. Reuel Armstrong, Interior Department solicitor, expressed hope the impasse would be broken as a result of a conference he held with the representatives. Armstrong said he "filled them in" with details of the federal Government's proposal for restoring operations until the Supreme Court has ruled on the jurisdictional question.

He revealed the group made eight suggested changes in the proposal. He said these would be forwarded, along with any action the Interior Department takes on them, to Louisiana officials.

This might pave the way for new meetings between the warring elements. The last meeting, held here August 3, broke up on a discordant note. No date had been set for renewal of negotiations.

Lengthening shadow . . . The arbitration move came on the heels of a disturbing report compiled by the offshore representatives.

Dated July 23, it estimated that 74 per cent of drilling rigs operating in the disputed area would be shut down within 30 days from that time and "the remaining wells will be completed and those rigs shut down at a rapid rate thereafter."

Details of the offshore report were included in a letter to state and federal officials. It pointed out that offshore drilling equipment could not be shifted at will between the disputed and non-disputed areas.

"Platforms and drilling barges," it read in part, "are designed for specific offshore locations. . . . If permits are not granted for these locations, they must stand idle."

No controversy . . . The letter pressed for an agreement based on "two points on which no controversy exists . . ." These were:

. . . That the injunction be modified to permit the resumption of drilling under existing leases.

. . . That future payments accruing under these leases be deposited in escrow pending the final settlement or adjudication of the controversy between the United States and Louisiana.

The letter continued: "These separate expressions are the basis for our statement that no dispute appears to exist . . . on the lifting of the injunction against future drilling. Remaining phases of the proposed agreement . . . necessarily will involve prolonged negotiations. . . "

The statements were followed up with a warning that "if the injunction continues, there will be a complete cessation of drilling in the disputed area before an agreement can be reached on such questions as whether and how back payments under existing leases can be impounded, whether leasing should be resumed, and whether the disputed area can be precisely defined."

The area in dispute covers approximately 5,217,920 acres or about 8,153 sq. miles. It includes 352 leases containing in excess of one million acres.

The letup in drilling has been rather gradual. Under the Supreme Court's order, operators were allowed to complete any wells already started in the disputed zone.

Mass shutdown . . . Some of these wells have not been completed, but practically all of them have either reached total depth or are nearing their goals. As a consequence, rigs will start a mass retreat from the disputed area if the controversy is not settled within 2 or 3 weeks.

Over-all activity in the Louisiana sector of the tidelands has not declined nearly as much as it has in the twilight zone where federal and state claims overlap.

A check of drilling reports showed 81 active rigs off the Louisiana coast on August 1. This total is only 12 under the number operating on June 1, just before the Supreme Court issued its partial ban on drilling.

During the same period, it is estimated that 20 or more rigs were idled in the area covered by the Supreme Court order.

Total number of shutdown rigs would have been much greater by now except for the removal of rigs from the twilight zone to within 3 miles of shore.

Since the federal Government recognizes Louisiana's claim to jurisdiction out to the 3-mile line, there has been no letup in drilling within that boundary.

Even those companies which have been able to keep all their offshore rigs active by moving them to "free territory" have done so at tremendous expense.

Expenses multiply . . . In addition to the cost of moving rigs, expenses have multiplied by maintenance of idle platforms, revising drilling programs, and duplication of equipment.

The four-company C.A.T.C. group has four platforms set up in the no-drilling zone, all without rigs. They can't be put to work until a settlement is reached in Washington.

Of the 10 rigs which have been operating for C.A.T.C. off Louisiana, the latest drilling report shows only three are outside the disputed zone. Two other rigs had finished assignments last week and were ready to move.

If the drilling ban isn't lifted within 2 weeks, most of the remaining rigs will run out of work in the area where the Supreme Court has forbidden the spudding of new wells.

Of the more than 20 operators active in the Louisiana tidelands, C.A.T.C. would be among the hardest hit by a long shutdown. The group is composed of Continental Oil Co., Atlantic Refining Co., Tidewater Oil Co., and Cities Service Oil Co.

A major part of C.A.T.C.'s more than 400,000 acres in gulf leases is in the disputed area. Although the group also controls some large untested blocks beyond the range zone, only a small number of its rigs could be moved there in the near future because equipment for deep-water operations is limited.

Leases expiring . . . Practically all leases lying beyond the disputed area, which ranges as much as 35 miles from shore in places, have been granted within the past 2 years.

Consequently, there is less urgency to explore there than on the older leases closer to shore. Some of the older 5-year leases are about to expire.

Gulf Oil Corp. is one of the more fortunate, since most of its offshore activity has been beyond the area in dispute.

Shell Oil Co. and The California Co. also have suffered relatively little hardship to date under the Supreme Court ruling. They both are conducting large development programs in fields near the shoreline.

Offshore operators are reluctant to comment publicly on the opposing stands taken by Louisiana and federal officials in the long-drawn-out dispute

They have been placed in an awkward role as mediators trying to find terms on which the governmental agencies can reach accord.

Most operators would be easily pleased. All they are asking at present is a chance to continue exploring and developing leases for which they paid staggering sums.

A few companies with little or no holdings in the gulf would like a chance to bid on submerged leases. But most of the big operators already have enough to keep them busy for many months, if the disputing agencies would only lift the drilling ban.

Some of them admit they are glad to have a letup in the competition for more leases.

New Unit Started

Furfural treating of virgin gas oil begun by Texas Co.

LOS ANGELES.—Furfural treating, long used for refining lube oils, is now being applied to processing virgin gas-oil cracking stock.

The world's first such unit has been put on stream at The Texas Co.'s 60,000-bbl. Wilmington refinery, J. S. Worden, Texaco vice president, disclosed last week.

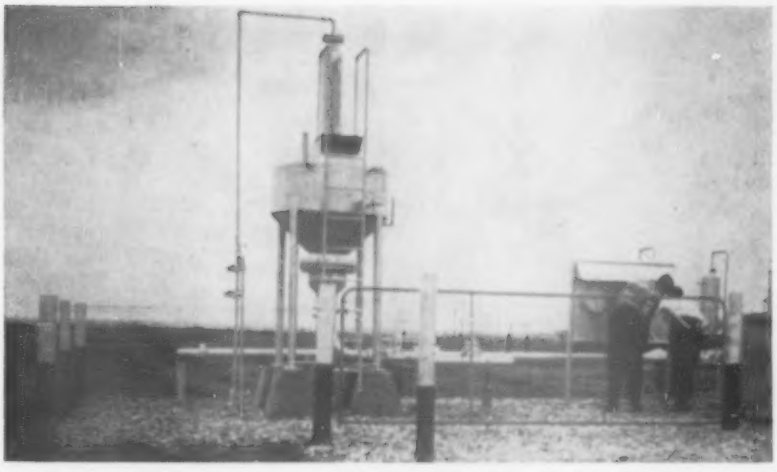
The unit has a gas-oil charge capacity of 25,000 bbl. daily and gives a yield of about 94 per cent raffinate.

It also is the first of its kind to employ centrifugal extractors in place of the conventional packed towers. Texaco employs similar units at its Westville and West Tulsa refineries to refine catalytic cycle stocks.

The furfural process was developed and is licensed by Texaco Development Corp.

Worden said the furfural process cuts sulfur content of the gas oil, extracts metal contaminants, and reduces aromatics content. It also results in an increased life for the cat-cracker catalyst.

A 13,000-bbl. deasphalting unit also has been completed at Wilmington. It charges vacuum residuum to produce a gas-oil stock for the furfural unit.



POSITIVE-DISPLACEMENT metering test at Webster field, above, helped convince Humble Pipe Line Co. it should drop hand-gaging in favor of metering in Anahuac field.

Metering Request Filed

Humble Pipe Line wants to drop hand-gaging in Anahuac field in favor of positive-displacement metering system

AUSTIN. — Humble Pipe Line Co. wants to drop hand-gaging of oil and go to positive-displacement meters at its leases in Anahuac field in Chambers County, on the Texas Gulf Coast.

The company sought a permit to do this from the Texas Railroad Commission at a hearing early this month.

Spokesmen for the company told the commission that it had tested oil metering in Anahuac since November 1954 and at Conroe and Webster fields since March 1955.

The meter results were checked against conventional gagers' measurements and found to be more accurate. Humble also contended that a metering system in the field would save manpower and steel and cut losses of hydrocarbon products through weathering.

Present losses . . . L. S. Wrightsman, company spokesman, said the pipeline is losing a lot of oil due to wax incrustation in lease tanks in Anahuac and resulting faulty hand-gage measurements.

A half-inch wax crust in all the tanks at Anahuac would cost the company 39,000 bbl. of oil a year or about $117,000, he said.

He listed other sources for error in hand gaging as: Fluctuation of weather temperature; tilted tanks; lack of tank symmetry; and others.

Meters can err, too, due to slippage, he said. But a prover tank can be used to determine the slippage factor, and this factor applied against metered volumes.

Delivery by meter . . . The Humble pipeline takes suction from the lease tanks to transfer Anahuac oil into the system.

The proposed installation would have an automatic shutoff to keep air out of the line. The oil would go through a conventional strainer, then through the pump, an air eliminator, and finally a meter and into the pipeline. A continuous sampling device at the meter would discharge a small slip stream into a vapor-tight container. Also at the meter would be a counter, set at the allowable for the day, which would automatically shut off when the allowable had been run.

Lead seals on the counter would quickly reveal any tampering with the device. The counter also would include a ticket printer. The printer would stamp the counter reading on a ticket prior to a pipeline run and a second reading when the run was completed.

Project draws support . . . Humble asked the commission first to permit it to use the meters and secondly to use the meter measurements to maintain records and file reports.

The Humble application was supported by Sun Pipe Line Co., Shell Oil Co., Sinclair Oil & Gas Co., and Sinclair Pipe Line Co.

VAN FIELD, shown here in 1931, was the world's first unit. It's kept up with the best engineering practices. As a result . . .

Aging Field Acts Like A Youngster

● At an age when most pools are dead or dying, amazing East Texas unit looks forward to another half-century

VAN, Tex.—The industry's long-time model oil field, the big Van Woodbine reservoir in East Texas, isn't acting its age.

Van will observe its twenty-seventh birthday this October. During its lifetime it has produced more than a quarter of a billion barrels of oil.

Many fields discovered about the same time have long since been abandoned. But Van is expected to become one of the all-time industry graybeards. It appears now that it will still be producing oil in the twenty-first century—and probably will have poured out another quarter billion barrels or more before the last well is abandoned.

It's fame isn't due so much to its prolific oil production, however, as to how it was produced.

Van was the first major oil field ever unitized, and the only one operated in this way for several years. Unit operation began less than a month after the discovery well was completed.

Van wells were choked back in a day of gushers and wild, wide-open production. A striking tribute to the wisdom of this course is that the remarkable field produces very nearly as much oil in a day now as it did a year after the discovery.

The same type of far-sighted operation is still there. This spring a second water-injection program was launched in the field by Pure Oil Co., as operator of the Van Joint Account.

A few weeks later, four of the field's 537 wells were producing oil automatically in an unusual "lease programing" project. The experiment has been going smoothly and likely will be expanded. It, like other Van innovations, probably will be copied.

How Van happened . . . Van has been called, with good reason, the "bread basket" of Pure Oil Co.

Pure, which has roughly 75 per cent of field production, completed the discovery well, the 1 Jarman, on the W. T. Jarman farm in eastern Van Zandt County, October 14, 1929.

As so often happens, Pure wasn't looking for the type of structure it found at Van when it first explored the area in early 1927. The company's geological department was investigating East Texas for deep-seated salt domes.

A surface party figured that the erratic dips and surface faulting in the southeastern part of Van Zandt County indicated an uplift near the community of Van. Pure sent a seismic party to detail the region. The resulting survey showed a large anticline cresting just north of Van.

The company followed through with a thorough survey of areal and structural geology, which disclosed an abnormal swing in the Wilcox-Claiborne contact.

Eight core tests were drilled between January and July 1929. These found oil shows in the shallow Nacatoch sand and confirmed the structure suggested by surface and seismic work. The company immediately started leasing and blocked out 17,000 acres.

At that time, nearest production was 55 miles southwest at Powell field of Navarro County and 45 miles southeast at Boggy Creek field in Cherokee and Anderson counties.

Pure spudded in the 1 Jarman in July 1929. On October 14, it kicked off at 2,710 ft. in the Lewisville zone of the Woodbine and flowed 149 bbl. of oil the first hour and 132 bbl. the

second hour through 9⅝-in. casing on a 1¾-in. choke.

Such a spontaneous flow was unheard of in the Woodbine, habitually a low-gas-pressure zone. Previous Woodbine finds in East Texas had required bailing or swabbing.

All 66 ft. of Lewisville pay penetrated by the 1 Jarman was found saturated. The oil was paraffin base, grading 35.4° gravity. After flow tests, a ½-in. choke was installed and well output cut back to 260 bbl. a day.

A new idea . . . Pure then made a surprise announcement. The company would drill 1 Tunnell on a lease owned by Shell Oil Co. It was the first hint of the now-famous Van Joint Account —oil's first large-scale unit operation. Pure was named operator of the field in the agreement adopted November 1, 1929.

Bounds of the original unit took in 5,800 acres, owned 81.7 per cent by Pure. Other operators were Shell, Humble Oil & Refining Co., Sun Oil Co., and The Texas Co.

Pure quickly erected 19,000 bbl. of storage near the well and laid a 20-mile 10-in. line from Van south to Chandler and the nearest railroad. The company built a loading rack at Chandler to handle 50 tank cars. The oil was moved by rail from Chandler to the company's Smith's Bluff refinery.

Van's second well, the 1 J. T. Thompson, was completed December 6, 1929, and the 1 and 2 Tunnell shortly after. All came in at rates comparable to the discovery.

By February 1930, eight wells had proved an area 2 miles long. In March, there were 10 wells making 10,000 bbl. a day on restricted production, with 14 more drilling. In April, 22 wells were producing 20,000 bbl. a day and 16 were drilling.

A month later 38 pinched-back wells were making 24,131 bbl. daily. There still had been no dry holes, and 22 rigs were busy.

In June, Van had 59 wells and no dry holes. All wells were coming in at substantially the same potential when tested through 11/16-in. choke. Plans were completed for a gasoline plant to process 10,000,000 cu. ft. daily of the unusually rich casinghead gas.

The plant was completed in September and went on stream producing 23,000 gal. of liquids a day.

On August 15, the field was ordered under proration by the Texas Railroad Commission. R. E. Andrews was appointed "umpire" at Van by the commission, and the field was restricted to a 27,500-bbl. daily rate for the next 90 days.

On its first anniversary, Van had

DISCOVERY WELL, 1 Jarman, kicked off in 1929, vaulted Pure Oil into majors. It's still flowing strong, along with 200 others.

133 wells, 16 drilling, and several more locations spotted. Some were penetrating as much as 400 ft. of saturated sand. Potential choked production was over ½ million barrels a day. At open flow, the field could have produced several million barrels daily.

Late in 1930, the 10-in. line was extended 210 miles to the Smith's Bluff plant and Pure Van Pipe Line Co. was set up to operate it. Headquarters were at Beaumont. The field at that time had storage capacity of 188,000 bbl., mostly in 500-bbl. tanks. Humble built a second outlet to Shreveport to connect with its line from there to Baton Rouge.

In 1931, Van field limits were extended beyond the unit boundaries on the northeast and southwest flanks. Development was methodical, with never more than 22 rigs working at one time. Drilling time was cut sharply.

When a new well was completed, the derrick and connections were painted light gray, the concrete white. Ground was leveled and derrick cleared.

Van's orderly development was in vivid contrast to that going on at its newly discovered big-sister Woodbine reservoir to the east, East Texas field. The latter was probably the biggest of all booms, with hundreds of rigs completing wells at a breakneck pace.

East Texas' tremendous oil flood soon capsized the world oil market and tumbled prices. The resulting great waste of oil and gas was lamented by the Texas Railroad Commission, and martial law eventually was declared before proration could be enforced.

Water injection started . . . By 1934, produced salt water at Van, as in most Woodbine pools, was beginning to create a problem. A salt-water disposal system was completed that year using surface storage.

In June 1943, two input wells were drilled to the Dexter zone of the Woodbine outside the field producing limits on the south and east. A third injection well was added in 1952. All produced water has been reinjected since.

To the first of June this year, the unit had returned 50,700,000 bbl. of water into the Dexter sand. The three wells are now taking a total of approximately 15,000 bbl. daily.

Unlike other Woodbine reservoirs in East Texas, Van has two producing zones, the Dexter and the Lewisville. The Dexter is the deepest and most prolific and has the Woodbine's characteristic strong-water drive. It has 237 producing wells.

The shallower Lewisville zone, with 300 wells, is a solution-gas-drive pool, containing only about 14 per cent of the total Van reserve. Its wells this spring were averaging only about 14 bbl. daily each.

In March, Pure kicked off a five-spot pilot water flood in this zone under its Van Joint Account Clark 80 lease in the southeast portion of the field. At June 1, a total of 45,000 bbl. had been injected, and the daily input now is about 620 bbl. It's too early yet for results, but it appears that the Lewisville is taking water satisfactorily.

Automatic experiment . . . This spring, too, Pure launched an automatic producing operation on its Swain 26 lease, which has four wells producing from the Dexter zone.

The four wells flow into a common separator then to the battery of four tanks. The entire operation is controlled by a panel designed and installed by Pure's production-engineering department.

The panel "searches" the tank battery using a stepping-switch arrangement, and checks each tank until it finds one ready to receive oil. Signals from the panel through messenger wires to the wells open hydramotor valves in the flow lines one joint from the wellhead and start the wells producing into the separator.

A float control in the separator relays messages to the panel. If the sep-

arator fills up too far, the panel closes another hydramotor valve at the separator, shutting off the flow.

Each lease tank is equipped with a liquid-level indicator and liquid-level controls. When one tank is full, the panel closes it off and looks for an empty. If it finds one, production is switched to it. If not, the entire operation is shut down.

An interlocking device on each tank makes it impossible for a tank to receive oil when the pipeline is running oil from it.

Varicolored signal lights at the panel tell the operator exactly what is happening throughout the operation.

One green light at the well indicates the well has received the message to produce. A second shows the well is producing.

A green light at the separator shows that the vessel is taking fluid correctly. A red one indicates the separator is full and should be shut off.

Each tank has three lights—two green and one blue. The first green light shows that the tank is ready to receive oil. The second that the tank is taking oil. The blue light warns that the pipeline is running oil from the tank.

The panel or brain of the system was built to Pure specifications and balanced by Kinetrol Corp., Dallas. The system is working smoothly and probably will be extended to other leases.

Policy pays off . . . Van field today boasts 537 wells producing an average of 45 bbl. each. This figures out to more than 24,000 bbl. a day for the entire field, which now takes in 6,216 acres. Field MER has been set at 45,000 daily by the Railroad Commission.

The Joint Account, comprising 4,002 acres, has 397 of the wells, while 140 produce from 2,214 acres outside the unit bounds.

Producing operations inside and outside the unit are essentially the same. The field MER, with an allocation formula based on acre foot-pounds, applies to both unit and nonunit wells.

Average bottom-hole pressure in the Dexter zone at Van now is 947 psi., only 283 psi. below the original 1,230 psi. The gas-oil ratio has fallen from the initial 324:1 to 302:1. No gas has been flared from the field in 26 years.

More than 200 of Van's wells, including the 1 Jarman, are still flowing. More than 50 wells have produced over 1,000,000 bbl. each, and several have produced more than 2,000,000.

Pure figures some of these wells will still be producing by the year 2005. Few other fields can match this performance.

Battle Looms Over U.O.P. Sale

ALBANY, N. Y.—William J. O'Shea, New York attorney, last week was named a referee in the proposed sale of Universal Oil Products Co. The announcement came amid growing indications that a bitter fight to block the sale might be developing.

Motions to intervene have been filed with New York Supreme Court by the Independent Refiners Association of America and Aurora Gasoline Co. of Detroit. Frontier Refining Co. was preparing a similar petition and a number of other independent refiners indicated they would follow suit.

M. H. Robineau, president of I.R.A.A. and Frontier Refining, declared that "U.O.P. has enabled the independent to survive and thus contribute a competitive petroleum industry to the public."

He termed the trust "aboslutely essential" to the success of independent refiners and warned that without free, nondiscriminatory access to processes made available by it "independent oil refiners may as well close their plants or face the prospect of involuntary demise."

The only previous objection to the sale came from Jacob K. Javits, New York attorney general. He said he didn't object to the sale "in principle," however, but that he felt the 10 per cent commission asked by Guaranty Trust Co. of New York was too high *(The Oil and Gas Journal, July 30, page 132)*.

The trust was established in 1944. The major oil companies owning U.O.P. turned over their stock to the trust and designated the American Chemical Society as beneficiary.

Probably the strongest bid to purchase U.O.P. has been submitted by Filtrol Corp. of Los Angeles, which outlined a bidding procedure it would like to see the court follow.

Drilling Firm Goes Offshore

TULSA.—Offshore drilling is getting a new contractor. Reading & Bates Offshore Drilling Co. will put a Levingston tender into operation this week and follow up with another one in November.

Both tenders have been leased to the C.A.T.C. group. If the United States and Louisiana settle their offshore territorial dispute in time, the units will probably go into operation in the West Delta area. If not, they will operate around Cameron, off Lake Charles.

The tenders, nonself-propelled, are 260 ft. long, 54 ft. wide, and 16 ft. deep. Constructed by Levingston Shipbuilding Co. of Orange, Tex., they were christened late last week. Cost of the units, fully equipped, is about $2½ million each.

The "J. W. Bates" will be towed to the drilling site immediately, while the "George M. Reading" will remain in the shipyards for outfitting. They are being equipped by National Supply Co.

The new offshore company brings the number of offshore drilling contractors to 19. There are now 10 contractors at work in the gulf with 18 barges or platforms. But 8 more either have units under construction or have announced plans for building them.

The equipment . . . The tenders will have two G-1,000 pumps, powered by three Waukesha 1,100-hp. supercharged diesels; 450-kw. electrical systems; a thermal-compressor water-distilling unit capable of processing 400 gallons of fresh water an hour; a 30-ton, 70-ft.-boom crane; and accommodations for 52 persons.

Platform equipment will include National 130 draw works two-engine-drive groups with 1,100-hp. engines; Halliburton units; and standby mud pumps and generators.

Reading & Bates will supply the crews and platform equipment. C.A.T.C. will furnish the drilling platforms. Day rate on a setup of this type is about $5,000.

The company . . . The new offshore firm, a subsidiary of Reading & Bates, Inc., Tulsa, was incorporated October 15, 1955. The tenders were ordered a few days earlier by Reading & Bates Drilling Co., Ltd., the Canadian subsidiary, and transferred to the offshore firm.

Reading & Bates, Inc., has been operating as a domestic drilling contractor since 1935. The companies are operating 13 rigs, 9 of them scattered over British Columbia, Alberta, and Saskatchewan, and 4 of them in West Texas, New Mexico, and Oklahoma. Most of the rigs are of the below-6,000-ft. type.

J. W. (Jack) Bates, Jr., president of the parent firm and vice president of the Canadian subsidiary, is president of the new offshore company. C. E. Thornton, president of the Canadian affiliate, is vice president. J. W. Bates, Sr., is secretary and treasurer of all three firms.

Flemming Urged to Act

Associations declare voluntary restrictions have failed to reduce imports, want "positive action" by Eisenhower

WASHINGTON.—A group of 19 oil-industry trade associations have petitioned Mobilization Director Arthur S. Flemming to take positive action to reduce the rising tide of petroleum imports.

The associations represent independent oil and gas producers, royalty owners, drilling contractors, and other individuals and companies engaged in the domestic oil-producing business.

Their combined petition stated that Flemming's efforts to control imports through voluntary action by the importing companies have failed. They asked Flemming to advise President Eisenhower that:

. . . **Imports have reached the point** where they impair national security and threaten to keep rising.

. . . **Direct action** should be taken by the Chief Executive to adjust petroleum imports to the 1954 relationship they held to domestic oil production.

The crisis . . . The independents paraded an array of familiar statistics before Flemming to prove imports are exceeding standards established by Congress.

The lawmakers had adopted a recommendation of the Cabinet Fuels Committee that the 1954 relationship of imports to domestic production be the guide for any controls over imports.

In 1954 petroleum imports totaled 1,052,000 bbl. daily. This was 16.6 per cent of U. S. production. Imports in 1955 totaled 1,248,800 bbl. daily or 18.3 per cent. The independents claimed this represented excess imports of 120,200 bbl. daily.

The increase was more notable in 1956. In the first 6 months, imports totaled 1,401,500 bbl. daily or 19.5 per cent of domestic output or an excess of 202,800 bbl. daily. The independents reported that imports for the second 6 months would reach 1,530,800 bbl. daily or 21.7 per cent for an excess of 370,900 bbl. daily.

What it means . . . The trade groups drew some blunt conclusions from the statistics. They told Flemming:

"The facts demonstrate that petroleum imports have continuously and increasingly exceeded the 1954 relationship to domestic crude-oil production since enactment of the Defense Amendment.

"Plans of the importing companies further show that during the next 6 months the excess of petroleum imports over the 1954 relationship will continue even to a greater degree . . . unless positive action is taken to restrict them."

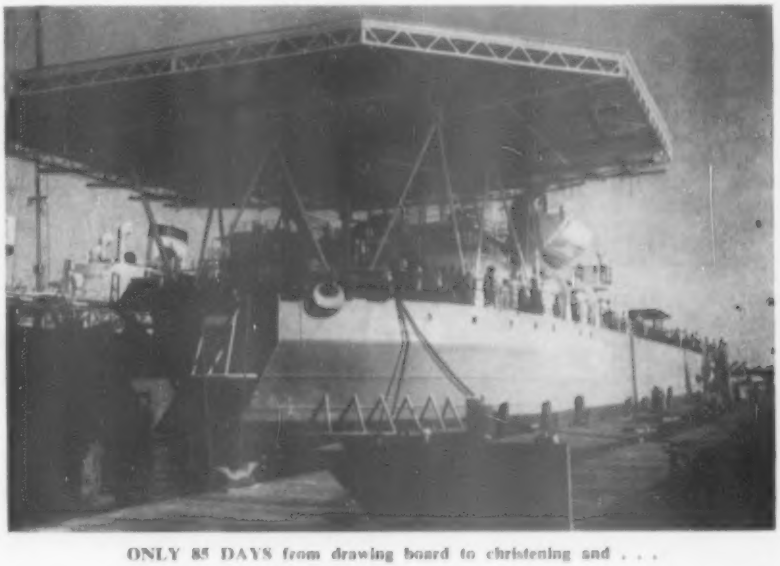
What to do . . . The oil groups did not call for any single line of presidential action but pointed out that Congress has given the President "whatever form of regulatory authority necessary to limit imports . . ."

The petition told Flemming "clearly there are no limitations as to the method the President may employ in effectuating the objective and purpose of the Defense Amendment."

Whether imports are controlled by tariffs, quotas, import taxes, or any other method apparently won't matter to the independents so long as an effective way of restricting imports is ordered.

The independents, however, noted that four separate letters sent out by Flemming to importing companies asking for their voluntary compliance with a restricted import plan have failed to stem the tide. They concluded:

"Failure of the importing companies, as a whole, to comply with the requests . . . eliminates voluntary action as a means of implementing the Defense Amendment, and now leaves no alternative to formal action under the law."



ONLY 85 DAYS from drawing board to christening and . . .

Freighter Now a Drilling Tender

JACKSONVILLE, Fla.—The impact of offshore oil drilling along the Gulf Coast on East Coast industry was emphasized here recently at the christening of a new drilling tender which had been converted from a merchant ship.

It was the first vessel of its kind ever converted in an East Coast yard. The ship was the Deepwater No. 1 owned by Deepwater Exploration Co. of Houston. Major interest in the firm is held by Anderson-Prichard Oil Corp. and Climax-Molybdenum Corp.

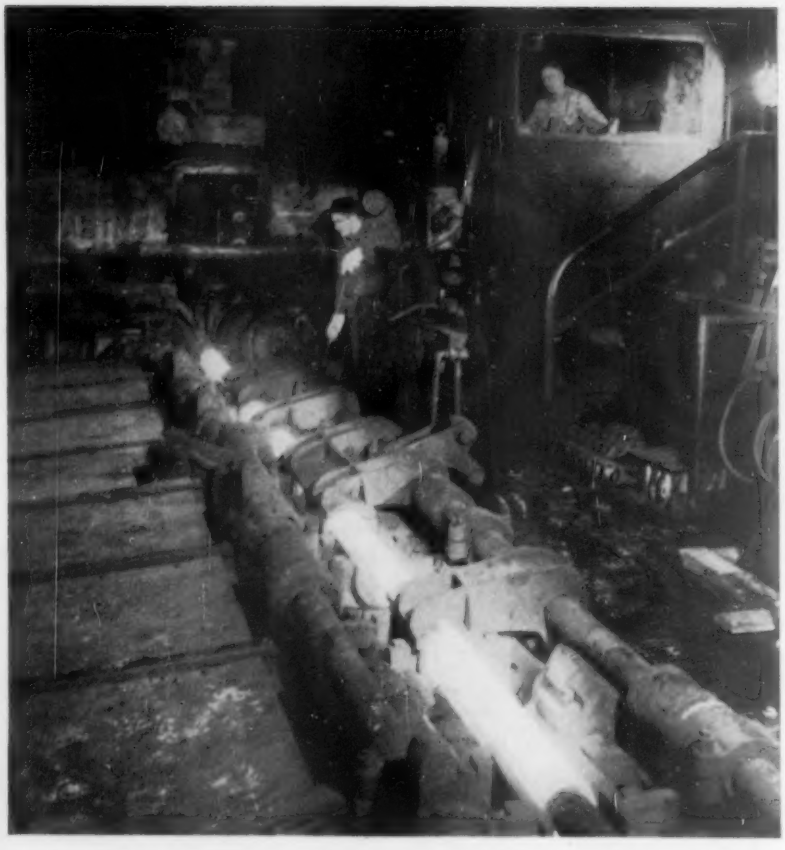
The tender was christened before 3,200 shipyard workers, civic leaders, and executives of the oil and shipping industries, just 85 days after the decision was made to convert the ship into offshore use. Naval architects completed drawings and specifications in 10 working days. The conversion, alteration, and rebuilding required another 75 days.

In order to have all equipment ready for the ship, Deepwater officials ordered drilling machinery capable of drilling to 20,000 ft. from National Supply Co. They contracted for the fixed platform from J. Ray McDermott of New Orleans, the diesel-electric generators, motors, and controls from Stewart & Stevenson, Inc., of Houston, and the 25-ton Whirley crane from Link Belt Co.

The entire package represents an investment of $3 million. The craft and platform will drill first about 12 miles off the East Cameron area of Louisiana.

How Steel Went Up

	Per cent increase
Line pipe—	
5-in. to 24-in. (seamless and electric weld)	7.5-7.8
26-in. to 36-in. (electric weld)	6.2
Casing (all sizes, J-55, short T & C)	8
Tubing (all sizes, J-55, upset T & C)	6+
Drill pipe (all sizes, D, internal upset)	9
Pumping units	10
Tanks (100-10,000 bbl., welded or bolted)	5½
Treaters	5½
Separators	5½
Heat exchangers	10-12
Valves (cast steel)	10-20
Fittings (welded)	12



MILLS STARTED rolling pipe again last week—at prices $9.50 to $21.25 per ton higher than before the steel strike. (Photograph courtesy of U. S. Steel News.)

Oil Starts Paying for Steel Increase

THE oil industry got its new strike-inflated steel bill last week.

And the extra tab which the industry will have to pick up as a result of labor contracts and higher material costs will easily exceed $75 million in the next year.

In the second sizable increase in as many years, the price of basic steel was raised last week $8.50 per ton to around $138. It was the first of three increases certain to come between now and the summer of 1958 as a result of the settlement with union steelworkers ending a 5-week strike.

This may be the biggest of the three. The union won about 20 cents an hour in benefits the first year of the 3-year package deal which gives workers more than 50 cents an hour on the average.

It compares with the $7.35 a ton increase imposed last July following a 15-cent raise granted the union.

As the basic increase was larger this time, so was the boost in steel product prices. Oil-country steel went up generally 6 to 9 per cent (see table), slightly more than the increase a year ago which followed a 12-hour shutdown.

The increases were greeted by oil men with mixed emotions. There was some surprise that they were not greater. The basic hike was about $1 per ton less than was expected on the basis of the wage increase. And it left some steel producers dissatisfied. Their feeling that it is inadequate could pave the way for upward adjustments before the next general increase next summer.

Costs pyramid . . . The $8.50 basic hike was only the beginning of the story, of course.

Had this been all that was added to the steel bill, it would have boosted industry costs around $51 million. This figure is based on an expected consumption of 6 million tons of steel products during the next year. But the total bill will come nearer being twice that amount.

The original increase, by the time higher labor and materials costs are added down the line in mills, fabricators shops, and in the field, may be doubled on the finished product, or even more in extreme cases.

The oil industry will pay almost $48 million more just for tubular goods, which comprise something less than half the total tonnage shipped to the oil industry.

Price breakdown . . . Some 60,000 wells will probably be drilled during the next year, and each of these wells can be expected to require about 50 tons of steel.

With oil country up from $13.75 to $21.25 a ton for standard grades, and more for alloy and special types, the bill for up to 3 million tons of tubular goods will increase probably $40 million.

Steel seems to be the principal limiting factor in booming pipeline construction. Mills are turning out line pipe at the rate of more than 3 million tons per year. And the $9.50 to $12 per-ton boost assures that steel going into pipelines will cost an extra $30 million or more during the next 12 months.

These two big categories, line pipe and oil country, would add at least $70 million to the industry's bill between now and next summer. And while this

accounts for the big tonnage items, there are others which will add more millions to the cost.

Plates were raised generally $7 per ton and up to $11 for alloy grades. Over-all the industry uses around half a million tons annually. But when the plate is converted into a tank, pressure vessel, heat exchanger shell, or offshore drilling platform, the total price is boosted by higher plant costs.

The same is true for structural shapes, up $8 to $11, as well as pressure and mechanical tubing (up 7½-8½ per cent), valves, fittings, and sundry other items that go to make the equipment and facilities which keep the oil business running.

Other hikes due . . . Late last week the steel companies and suppliers were still figuring new prices on some products.

There had been no announcement on sucker rods, which a year ago were raised 5 per cent. Based on the new price of steel, another increase in the neighborhood of 5 per cent can be expected.

Rock bits, tool joints, and numerous other products will no doubt be raised in due time. Some increases may be strung out over the next several weeks, if past experience is any indicator. Facilities erected in the field may be due increases in the fall when additional labor contracts expire.

The increases listed in the table from which cost figures have been computed were based on early announcements by a few companies. In the first week after the strike ended, most companies had yet to post new prices. Oil-country and line-pipe prices were quoted from U. S. Steel Corp., the price leader, and other producers traditionally follow suit. Fabricated items which go into plants and units constructed in the field vary from one manufacturer to another. Some are subject to competitive bids and thus somewhat flexible. Part of the quotations were early estimates, and suppliers said a more thorough study of costs and profits later may produce adjustments. But on the whole the percentage increase can be expected to stick at those levels.

Effect on operators . . . Oil companies were making room in their budgets for higher steel prices well before the strike started July 1.

The mythical average operator will use 12 to 13 tons of steel per thousand feet in drilling a well, not counting related equipment such as pumping units, gathering lines, and tanks required to place it on production. This average well will be taken to just below 4,000 ft.

At post-strike prices it costs approximately $750 more per well for steel in the ground. A pumping unit selling for $2,500 before the strike is now $2,750. And so the story goes with practically every piece of equipment connected with a well.

Operators in deep-drilling areas will feel the increase more than anyone else. One major company which does a great amount of deep drilling figures its steel consumption at 80 tons per well, around 60 per cent above the average. And the cost curve rises more steeply with added depth because of high-priced alloy pipe requirements. This company, with a 700-well program, will bear a heavier share of the steel increase than the average operator who can get by at shallower horizons with standard grades of steel. His costs per ton will be higher.

Cost squeeze . . . No phase of the industry will escape the higher costs.

It costs substantially more for the contractor or operator to drill a well, to complete it, to gather the crude, store it, transport it, and to process it.

The steel increase will tighten the squeeze in which the oil industry has found itself for some time. The comment of one oil man—"I wish it were as simple to raise the price of crude"—echoed a common plaint heard from producers whose last hike was 3 years ago.

The same oil man recognizes the great difference in the steel man's situation and his own. The one operates in a market approaching scarcity, the other an oversupply brought on by excess domestic producing capacity and record imports.

As a result, oil men have little prospect of recapturing the increased costs which have been passed on to them following new labor contracts in steel and allied industries. They have no choice, under present circumstances, but to absorb the higher material costs as they have absorbed higher wages granted their own employes.

Drilling contractors figure they were hit coming and going. Drill pipe bore the heaviest per ton increase of any oil-country item. And they have little hope of passing on their increased costs to the companies they drill for because of higher costs faced by the companies.

How Pipe Prices Increased

	Increase per ton
Buttweld pipe, ½-4 in., black and galvanized	$12.00
Seamless pipe, 2-4 in., black and galvanized	$12.00
Seamless and electric weld pipe, 5-24 in., black and galvanized	$11.50
Electric weld line pipe, 26-36 in.	$ 9.50
Oil-country casing, J-55, short T&C, all sizes	$13.75
Oil-country tubing, J-55, upset T&C, all sizes	$14.25
Drill pipe, D, internal upset, all sizes	$21.25

Note: Proportionate increases posted on all other grades and types of oil-country goods.

Imports from Saskatchewan Dip

REGINA.—A 1,763-bbl. drop in Saskatchewan crude deliveries into the United States was registered for the second quarter of the year. But a big jump in June indicates the decline is only temporary.

First-half imports from the province amounted to 16,210 bbl. daily, according to the Saskatchewan Department of Mineral Resources. Daily averages were 15,329 bbl. during the second quarter and 17,092 bbl. during the first.

The recession was partially caused when Great Northern Oil Co. of Pine Bend, Minn., stayed out of Midale field during the entire second quarter and Dollard field during April.

Despite this, however, the company easily remained the biggest of the two United States buyers in Saskatchewan. It took a total of 1,131,200 bbl. during April, May, and June. Most of its purchases were from Cantuar, Fosterton, Battrum, and Success fields.

The other United States buyer, Northwestern Refining Co. of St. Paul Park, Minn., took 263,692 bbl. during the same period. Northwestern bought from Dollard and Midale fields.

The daily averages for Great Northern were: April, 11,432 bbl.; May, 11,616; and June, 14,271. The company's total daily average for the second 3 months was 12,431. This compares with a daily average of 13,295 bbl. during the first 3 months.

Deliveries to Northwestern were also down from the first 3 months. The second-quarter total for the firm was 2,898 bbl. daily, compared to 3,797 bbl. daily for first quarter. Northwestern's daily averages were 2,305 bbl. in April, 3,231 bbl. in May, and 3,146 bbl. in June.

The two companies together took daily average deliveries of 13,737 bbl. in April, 14,847 bbl. in May, and 17,417 bbl. in June. The June deliveries were the second largest for the province during the first half of the year. The leading month was January, with daily deliveries running 21,834 bbl.

U. S. Losing Tanker Rank

American fleet may drop from first to third unless trend halted; world tonnage boosted by bigger, faster vessels

THE United States flag tanker fleet slipped further during 1955 in a postwar trend which may displace this country as the world's leading tanker owner by 1960. This is the conclusion of Sun Oil Co.'s annual analysis for the world's tanker fleet.

Sun's warning was underscored in midweek by ceremonies at Kure, Japan, where the world's largest tanker to date was launched. The ship is the 83,900-ton Universe Leader, built by Japanese yards for National Bulk Carriers. It has a 55-ft. draft and will trade between Iran and North America.

But its chief advantages in the trade will be a 14.5 knot speed and a capacity of 707,000 bbl. of crude. That's more than the daily oil production of Oklahoma, the fourth largest producing state.

Meanwhile, Japanese officials revealed they planned to build two atomic-powered supertankers by 1966, indicating they would carry both oil and ore.

Japanese also reported plans were progressing for building a sister ship to the Universe Leader and two other vessels of 87,200 tons.

American rank slips . . . The annual Sun analysis of the world's tanker fleet turned up these facts on U. S. position:

. . . **U. S. flag tankers** had only 20.8 per cent of the world's carrying capacity at the beginning of 1956. This compares with 23 per cent the year previous and with almost 60 per cent in 1945.

. . . **British tanker tonnage** accounted for 16.9 per cent of the world's total and this percentage is growing.

. . . **Norway was third** with 15.4 per cent of the total oil-carrying capacity.

Unless the twin trends of continued transfer of U. S. vessels to foreign flags and less and less building for U. S. registry are reversed, the United States will slide to the third place by 1960 with Britain taking first and Norway second.

The percentage figures for the U. S. tonnage pertain strictly to ships flying the American flag. U. S. capital actually controls 35.5 per cent of the world's tanker tonnage under Panamanian, Liberian, and British flags. There were 823 tankers under U. S. control at the beginning of this year, 490 under American registry, 123 flying Panama's flag, 72 under Liberian colors, and 54 flying the Union Jack.

World tanker fleet grows . . . The worldwide tanker fleet continued to grow in 1955 to a total of 2,681 sea-going vessels of 2,000 gross tons or more.

The total tonnage was 27,338,000 gross and 41,623,100 deadweight, increases of 6.3 per cent in both figures. The numerical increase of 79 additional tankers amounted to only 3 per cent over the previous year.

The average tanker at the beginning of this year had increased 500 tons in size to 15,500 deadweight tons, but the average speed gained only one-tenth of a knot to 14 knots. These figures should change rapidly, however, as the world's shipyards turn out more and more of the speedy super-supertankers that are now being built.

Sun Oil's figures, as of December 31, 1955, revealed that the average vessel under construction or on order in the world's shipyards is 26,600 tons. More recent figures from the American Bureau of Shipping indicate this will go much higher this year.

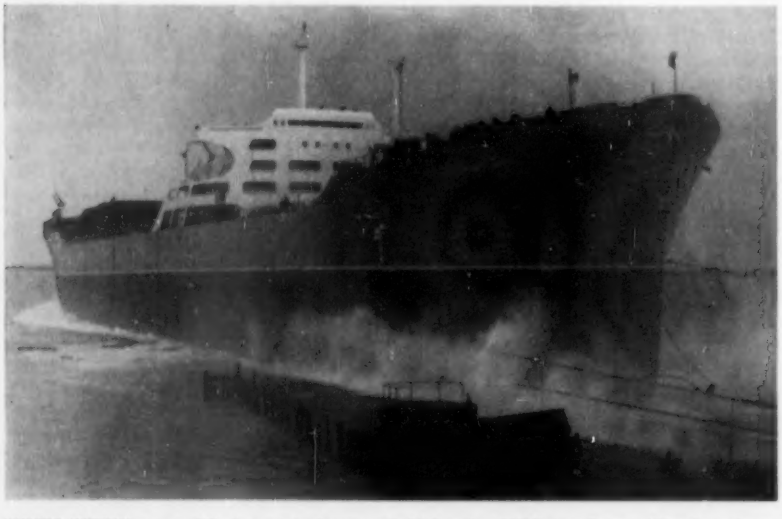
More than 125 of the 500-odd tankers being constructed in the world's shipyards in June of this year were in the 30,000-ton class and larger, ranging up to 83,000 deadweight tons.

This jump in the size of tankers, in the quest of a more efficient shipping operation, brings its problems, too. Tankers in the larger class have difficulty finding unloading points large enough to accommodate them. The larger ones cannot negotiate the Suez Canal fully loaded.

Sun Oil's study reveals that at the beginning of this year, 117 of the world's fleet, most of them under foreign registry, had a draft of 34 ft. or more. This represents 8.4 per cent of the total tonnage in the world's tanker fleet and is nearing the 35 ft. maximum which the Suez Canal can handle.

Company-owned tonnage . . . On a T-2 equivalent basis, U.S. oil companies own 68.6 per cent of the privately owned American tanker fleet. American oil companies own and operate 239 of the 347 vessels in this class. The average speed of the company-owned tankers is 15 knots, 1 knot above the world average.

Standard Oil Co. (N.J.) and its subsidiaries rank first among the oil company ship owners. Gulf Oil Corp. is second and The Texas Co. third.



BRIEF REIGN as world's largest tanker was held by the 47,750-ton Spyros Niarchos shown being launched only a few months ago at the Vickers-Armstrong yards in England. It is chartered to Shell Oil Co. for the Persian Gulf-United Kingdom run. Present world's largest tanker is 83,900-ton Universe Leader launched in Japan this month.

Crude Arrives for New Plant

DELAWARE CITY, Del.—The first crude shipment of Tidewater Oil Co.'s new 130,000-bbl. per day refinery was made August 10 as the "S.S. Flying A Delaware" discharged 185,000 bbl. of Louisiana crude.

Taking part in the valve-turning were Delaware Governor J. Caleb Boggs; George C. Caine, Tidewater's eastern division manager of manufacturing; and George F. Getty II, director, vice president and general manager of the company's eastern division.

The 130,000-bbl. crude unit is due to go into initial operation next month. The entire refinery will go on full stream the end of the year.

Sargent PUMPS

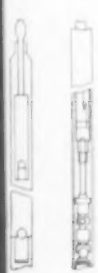
engineered to lift more oil per day at lower costs per barrel

Recognized leader in the development of bottom-hole production pump design, Sargent leads the field in pump engineering, combined with research and manufacturing skill to build pumps that put more oil in your tanks every day, month after month, with minimum maintenance and at lower cost per barrel.

SERVICE Sargent recognizes the importance of pump maintenance and provides the most complete service facilities in the industry. This service is always available through Sargent sales and service stores conveniently located throughout the oil country and staffed by company-trained pump experts.

On the basis of performance and service, Sargent pumps give you more for your money.

Write for complete details.



Sargent, who originated the Insert Rod Sectional Liner Pump, once again offers the latest and best method of pumping oil, through its development of the Sargent Rodless Hydraulic Pump. This pump puts the long stroke unit at the bottom of the well, where it belongs, to operate hydraulically the time-proven standard bottom-hole pump. Rod problems and tubing wear are eliminated. The ultimate in gas compression ratio (elimination of gas lock) is thus obtained with this unit because pump valves are accurately spaced before the pump is run into the well.

Standard Sargent API pump parts facilitate service maintenance of the rodless pump, which can be repaired in any of the Sargent sales and service stores.

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BUILDS PUMPS THAT BUILD GOOD WILL

"GOOD WILL" is the disposition of the pleased customer to return to the place where he has been well treated.
U. S. Supreme Court

DEEP CUTS were necessary in ditching for a coal slurry pipeline in Ohio since no grade on the line could exceed 10°.

Slurry Line Ready

New pipeline carries coal from mine to power plant

CLEVELAND.—Finishing touches last week were put on a novel 108-mile, 10-in. pipeline from Cadiz, Ohio, to the plant near here of the Cleveland Illuminating Co.

The line will move coal from Pittsburgh Consolidated Coal Co. mines to the power plant. The coal will be pulverized, mixed with water to form a slurry, and then pumped through the line. At the Cleveland end, the coal will be dehydrated and used as plant fuel.

Williams Brothers Co. of Tulsa faced several tough problems in laying the line. Its contract called for no grade on the line to exceed 10°. This necessitated much deeper cuts for ditches in many areas along the line than is the usual practice in pipelining.

Thick-walled pipe also was used on the line with the thickness ranging from a half inch to nearly an inch. This caused no unusual trouble but required slower and more expensive welding operations.

Williams Brothers began work on the line last fall and completed the first 30 miles before winter weather set in. Its contract allowed a layoff during the winter months, and work was resumed this spring.

Oil Men Oppose Bill

Conservation act defeated in San Joaquin Valley poll

BAKERSFIELD.—Members of the powerful San Joaquin Valley Oil Producers Association, representing 38.4 per cent of the state's oil production, have voted overwhelmingly against the controversial proposed conservation act in a private poll conducted recently.

L. R. Seaman, president of the group, said vote of the membership was taken to refute claims that most of the state's producers favor the initiative measure. Seaman reported more than 80 per cent of the membership voted against the bill in the poll.

Order denied . . . On another front, proponents of the bill, which will be on the November 6 ballot, scored a court victory. The state Supreme Court denied without comment a writ of mandate aimed at keeping the measure off the ballot.

Charles L. Smith, Los Angeles taxpayer, had filed the suit contending the bill violated the state constitution by naming specific individuals to jobs in an initiative measure.

Opposing Smith's suit before the state Supreme Court were Secretary of State Frank M. Jordan and Charles S. Jones, president, and R. W. Ragland, vice president, of Richfield Oil Corp., sponsors of the proposal.

Butadiene Giant to Expand

PORT NECHES, Tex.—Work has started on a multimillion-dollar expansion program which will increase output of the world's largest butadiene plant more than 50 per cent.

Officials of Neches Butane Products Co. said capacity of the company's installation here will be boosted to 300,000 short tons annually. Full production from the expanded facilities is scheduled for the fall of 1958. But some of the increased output will be realized late next year.

Largest of the butadiene plants built by the Government to boost synthetic-rubber production, the Port Neches plant had a rated capacity of 190,000 short tons annually. It was purchased by Texas-U. S. Chemical Co. and Goodrich-Gulf Chemicals, Inc.

Processing BRIEFS

WASHINGTON.—Tidewater Oil Co. has received a certificate of necessity granting rapid amortization on 50 per cent of $7,600,000 and 65 per cent of $9,100,000 spent on expansion and improvements at the 114,000-bbl. per day refinery at Avon, Calif. Tidewater is building a 42,000-bbl. per day fluid coker, a 47,500-bbl. fluid catalytic cracker, and a 24,000-bbl. hydrodesulfurization unit at the refinery.

Standard Oil Co. (Ohio) also received a certificate covering part of the $513,000 being invested in new refining facilities at Lima, Ohio.

NEW YORK. — American Oil Co. has sent out request for bids for a second large Ultraformer to be built at its Texas City, Tex., refinery. The 21,000-bbl. daily unit will be equipped for naphtha desulfurization. Contract will be awarded in the next 2 months. Completion is scheduled for the end of 1957.

HALIFAX, N. S.—Imperial Oil, Ltd., is adding a 7,000-bbl. per day Powerforming unit and a new L.P.G. recovery plant to its major expansion and modernization program now nearing completion here. Foster Wheeler Corp. is the principal contractor.

Now on stream are five major refining units which amount to virtual rebuilding of the existing 18,000-bbl. refinery. Included are a 41,625-bbl. crude unit, a 10,625-bbl. visbreaker, 3,100-bbl. per calendar day capacity in thermal reforming, a 15,200-bbl. Model IV fluid catalytic cracker, and a 4,000-bbl. catalytic polymerization unit. Dedication of the new facilities is scheduled in October.

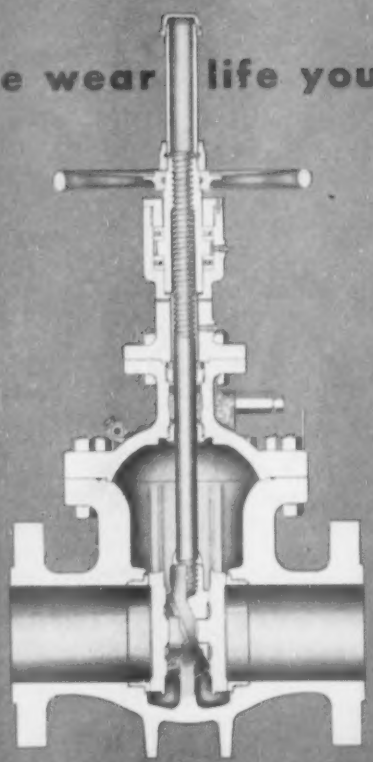
BAYONNE, N. J.—Esso Standard Oil Co.'s mechanical department is under way on a major turnaround which will completely revamp the company's 6,500-bbl. per day methyl ethyl ketone solvent dewaxing unit here. During the 15-day period, the company will tie in three new 700-sq.-ft. rotary vacuum filters which will replace the old sweaters of the second dewaxing stage.

BAYTOWN, Tex.—Humble Oil & Refining Co. has announced that Foster Wheeler Corp. will construct the third fluid catalytic cracker at Humble's Baytown, Tex., refinery. With a design capacity of 55,000 bbl. per day, the new unit will boost the refinery's total fluid cat-cracking capacity to about 163,000 bbl. daily.

Construction is tentatively scheduled to start about next January. The unit is expected to go on stream about a year later.

New CRANE Double-Disc Valve

has the wear life you want on pipeline service



ORDER NOW!

Available in sizes 4 to 24 inches; flanged ends (No. 1680) or butt-welding ends (No. 1681). Either spur or bevel gearing can be provided. For full details, see your local Crane Representative or write to address below.

Developed for both oil and gas transmission, this new Crane gate valve has the long-wear features you want for steady, trouble-free service in your lines.

This new Crane valve design has free-to-rotate double discs—hung independently to change seating position with every operation. Each time this valve is opened or closed, both discs are free to turn to provide cleaning action on seating contact areas, and thus prevent abrasive materials from collecting.

Disc clearances are always accurate, because the two identical discs move up and down in machined body-guide ribs—which take the service abuse usually forced on disc faces in conventional double-disc gate valves, a frequent cause of damage and costly maintenance.

Consider and compare, too, the perfect disc alignment in this smooth-working Crane pipeline valve. Annular-shaped machined wedging surfaces keep both discs and the body ring seat faces lined up at all times—and, in addition, compensate for any slight body deflections caused by line strains.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill.—Branches & Wholesalers Serving All Areas

Price Cuts Hit New Areas

Phillips reduces Panhandle postings; D-X Sunray and Rock Island act in southern Oklahoma; Gulf Coast may be next

REDUCTIONS in the prices for crude spread into the Texas Panhandle and southern Oklahoma last week.

The downward adjustments were set off 3 weeks ago when major purchasers posted a 7-cent price cut in West Central Texas. That action was described as a revaluation of the crude on the basis of its refining qualities and competitive position with other crudes *(The Oil and Gas Journal, July 23, page 64)*.

The price adjustments then spread to two counties in North Texas *(The Oil and Gas Journal, July 30, page 124)* and last week included these areas:

. . . In the Texas Panhandle, Phillips Petroleum Co. posted a 7-cent per barrel price drop in the crude it buys in Hutchinson, Gray, Carson, and Ochiltree counties.

. . . In southern Oklahoma, Rock Island Oil & Refining Co. and D-X Sunray Oil Co. posted a $2.80 top for sweet crudes, making them equal in price to some so-called sour crudes.

Both reported they merely were meeting competition which several months ago dropped sweet-crude prices from $2.90 to $2.80. Counties involved are Carter, Comanche, Cotton, Jefferson, Murray, and Stephens.

Chain reaction . . . The Phillips action caught several big buyers in the Panhandle area by surprise.

But in announcing the new postings, Phillips stated it was extending to the Panhandle the 7-cent a barrel reduction made in West Central Texas, changing the classification of crude to West Texas intermediate.

Phillips is the major buyer in the Panhandle, accounting for about 38,000 bbl. daily of the approximately 100,000 bbl. daily production. Other buyers include Humble, Magnolia, Shamrock, and Texaco.

Crude's worth . . . At least one purchaser said that Panhandle crude is considered a desirable type.

It is rated on the borderline between sweet and sour, averaging out about 0.56 per cent sulfur. In this respect, it roughly is equivalent to West Texas intermediate grade.

However, some refiners consider the Panhandle crude a special type. It is used by one company to make aviation lubricating oil and often is traded at a good price for low-cold test crude on the Gulf Coast.

Quality of the crude was the chief argument used by Panhandle producers who quickly protested the Phillips posting. A group of independent oil men gathered in Amarillo immediately after the price cut and drew up a statement to Phillips and other crude buyers which said in part:

"The cut in Panhandle oil is not justified. The cut in West Central Texas crude oil was made because of its inferior quality, but no such condition exists in the Panhandle."

The operators called on the other purchasers not to follow Phillips' lead.

Where next? . . . Crude buyers all expressed ignorance of where the crude price cuts might hit next.

But some say privately they expect price adjustments may come in Texas District 2 on the Gulf Coast and District 4 in South Texas.

The buyers report that in view of the recent cuts sweet crude in many fields in these two Texas districts is overpriced for its value to the refiner in comparison with others available.

One example is Seeligson field crude in Jim Wells and Kleberg counties in District 4. The going price there is $3.10 for 40°-gravity and above. It is piped to Corpus Christi and barged into the Beaumont area at a total cost to the refiner of $3.40 a barrel. But West Texas intermediate crude at $2.83 a barrel in the field and 22 cents pipeline charge reaches Beaumont at a total cost of $3.05 a barrel or 35 cents cheaper.

Seeligson crude has good processing qualities, but the 35-cent differential may force refiners to use a more competitive crude.

One buyer also points to another weakness in this area. He says producers recently have had trouble marketing oil from Red Fish Bay, Copano Bay, and other fields. He thinks this is because the oil isn't worth what the refiner has to pay for it.

It's competition . . . The southern Oklahoma action of Rock Island and D-X Sunray was described as merely a move to meet what competitors had done.

The D-X Sunray statement said the company "had delayed making the downward adjustment more than 2 years from the time other buyers initiated the lower prices. The adjustment . . . merely brings the D-X Sunray prices in line with those of other purchasing companies for crude oil of equal refining values."

The new price schedule will be $2.80 per barrel for crude oil of 40°-gravity and above, graduating downward to $2.20 a barrel for oil below 21° gravity.

D-X Sunray buys about 9,000 bbl. daily in the affected counties. Rock Island's action reportedly cuts the price on about 9,000 bbl. daily of the 45,000 bbl. it buys. Other buyers in southern Oklahoma include Shell, Skelly, Stanolind, Cities Service, Magnolia, and Ben Franklin Refining.

One buyer expressed doubts that the lower prices would depress values in neighboring Garvin County. But another purchaser said the cuts could easily spread to that big producing area.

Garvin County sweet crude still carries a $2.90-a-barrel top with a 2-cent differential for each degree of gravity below 40°. The southern Oklahoma sweet crude, now lumped into the same bracket as sour, brings only $2.80 a barrel top with a 3-cent differential.

Keep an eye out for . . .

The Journal's Annual Canadian Issue

NEXT week, The Oil and Gas Journal's annual Canadian issue will present a comprehensive picture of the oil industry in Canada. For months, Journal editors have roamed the prairie provinces and eastern areas, rounding up authoritative articles on every phase of Canadian oil. Henry D. Ralph visited the Saskatchewan region, Frank J. Gardner covered the Alberta plains, Engineering Editor G. L. Farrar surveyed the eastern refining centers in Quebec and Ontario, and Pipeline Editor Paul Reed followed the bustling pipeline activities from one Canadian coast to the other.

The results of all this reporting activity will be packed into one big Canadian issue next week. It will open with a two-color, eight-page Journal report on the oil and gas fields of Canada—the most complete listing of pools and reservoirs ever to appear in print. There will be details of reservoir characteristics and production data, plus complete tables on refining characteristics of representative Canadian crudes, pipeline tariff information—AND 19 major articles on exploration, production, drilling, refining, and pipelining in Canada, where oil is king.

To celebrate its first birthday

THE D9 GETS INCREASED HP

—more power for your operation!

320 HP
(FLYWHEEL)

formerly 286 HP

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(DRAWBAR)

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The giant Turbocharged CAT* D9 Tractor, which since its introduction last year has set new performance standards in the field, now packs more power than ever to handle even bigger jobs. Its drawbar capacity has been increased from 230 HP to 260 HP—its flywheel horsepower from 286 to 320!

This increase in power reflects Caterpillar's policy of leadership in action. Combining research with practical field experience, there's constant product improvement to meet your needs for bigger production at lower cost. This policy applies to *every* product in the Caterpillar line—Diesel Engines, Tractors, Motor Graders and Earthmoving Equipment.

Now, with its increased horsepower, you can give the D9 tougher jobs than ever before. To match your requirements, it's available with torque converter or direct drive with oil clutch. For complete details about the more powerful D9, see your Caterpillar Dealer. Name the date—he'll be glad to demonstrate!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

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Youngstown's "big 5"

MEAN ELECTRIC WELD LINE PIPE PROVEN AND READY FOR OIL AND GAS PRODUCING AREAS

Here are the "Big 5" reasons why Youngstown Electric Weld Line Pipe is your best buy:

1. It bends readily
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5. Long lengths save you time and trouble

In the process of producing Youngstown Electric Weld Line Pipe, every means is explored to assure uniform wall thickness. Uniformity of wall in the pipe begins with control of the skelp thickness produced on the rolling mill. The experience plus control in the rolling of the skelp by men who know steel makes this uniformity possible. Youngstown as an integrated producer has full control over the skelp rolling as well as the finished pipe production. To test the uniformity and quality, the pipe is then placed in a hydrostatic testing machine where internal pressure is applied. To obtain Electric Weld line pipe of uniform wall thickness—specify Youngstown Electric Weld line pipe for your next pipe line job.

Youngstown maintains sales and service offices throughout the oil and gas producing country—see your area representative soon.

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THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

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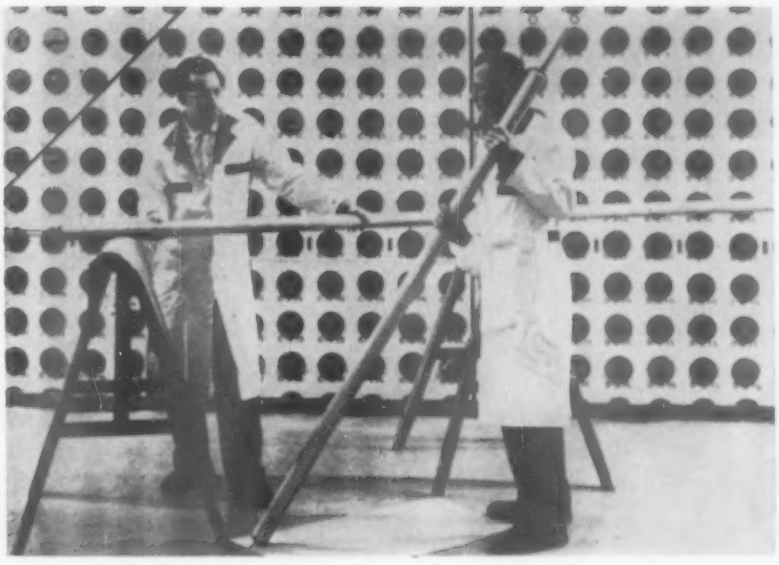


FLOW LINE for petroleum samples to pass through reactor is being examined by Atlantic Refining Co. scientists. They have created . . .

Atomic Refinery in Miniature

PHILADELPHIA.—Scientists of Atlantic Refining Co. have created a miniature atomic refinery. It is the latest development in their studies of the effects atomic radiation has on petroleum conversion.

Researchers for Atlantic designed, constructed and installed the pilot plant in the atomic pile of the Atomic Energy Commission's Brookhaven National Laboratory at Upton, Long Island.

The installation consists of a loop of aluminum tubing encased in a tubular shell inserted in the atomic pile. The circuit through which petroleum fractions are circulated is in the form of a double spiral. This permits a maximum exposure to the very powerful gamma rays from the reactor. Proper shielding is provided to prevent the petroleum fractions themselves from becoming radioactive.

By means of circulating and automatic control equipment installed outside the pile, samples may be withdrawn from the loop at any time without shutting down the experiment.

A new phase . . . With this move, Atlantic enters its third important phase of studies involving radioactive studies.

The company pioneered in this field by irradiating piston rings in a cyclotron before the days of the first atomic reactor. These rings, used in engine wear studies revolutionized techniques for obtaining rapid, accurate results on wear of numerous engine parts. Such techniques are now routine in most oil and automotive laboratories.

Atlantic's second move was the installation last year of a million-volt particle accelerator in its research and development laboratories in Philadelphia. The company's original announcement was closely followed by several others, as the oil industry adopted this phase of study.

With the vastly greater energy afforded by direct exposure in an atomic pile, Atlantic now has available greater volumes of petroleum samples, said Dr. H. W. Field, vice president and general manager of research and development.

"More important," Field added, "from these results we hope to be able to make a more accurate appraisal of the economic possibilities of atomic radiation in full-scale petroleum refining. It is also possible that this effort could lead us to new petroleum products not possible by any other route."

Imperial Studying Lake Erie

LEAMINGTON, Ont.—Underwater gravity meters are probing the bottom of Lake Erie for possible oil-bearing structures.

Two diesel launches of Radar Exploration Co., Toronto, are at work in the lake for Imperial Oil, Ltd., which has Ontario Province permits to explore 30,000 acres of lake bed. One launch is operating near Point Pelee, the other near Rondeau Harbor.

Shipley Unit Asked

● Flood will recover extra 6,000,000 bbl., commission told; Adair flood approved

MONAHANS, Tex.—Unit operation and a water flood are in the works for the Queen sand under 1,380 acres in old Shipley field of Ward County, West Texas.

The water flood, a salvage proposition, is expected to hike total recovery from the unit area by roughly 6,000,000 bbl.

Working interest is completely signed up, and about 88 per cent of royalty interests have approved the unit agreement. Sinclair Oil & Gas Co. will be operator.

Sinclair took the plan to the Texas Railroad Commission in Austin last week for its approval.

The Shipley Queen sand reservoir, discovered in 1928, now has 168 wells on about 3,000 acres. The proposed unit has 104 of the wells. The reservoir, an anticlinal fold, has a net 30 ft. of sand and dolomite pay topped at about 2,350 ft. Average per-well production is down to about 3 bbl. a day.

The planned flood calls for a closed-type system on a 20-acre, five-spot pattern. Initially 12 producers will be converted to input service and will inject about 400 bbl. of water per day each at 600 to 800 psi.

Eventually there will be about 65 input wells . . . 12 of them drilled, the rest converted from production.

The first well in the unit area was completed in May 1929. Since then the leases in the proposed unit have produced nearly 8,000,000 bbl. of oil. Sinclair estimates present oil saturation at about 50 per cent of pore space.

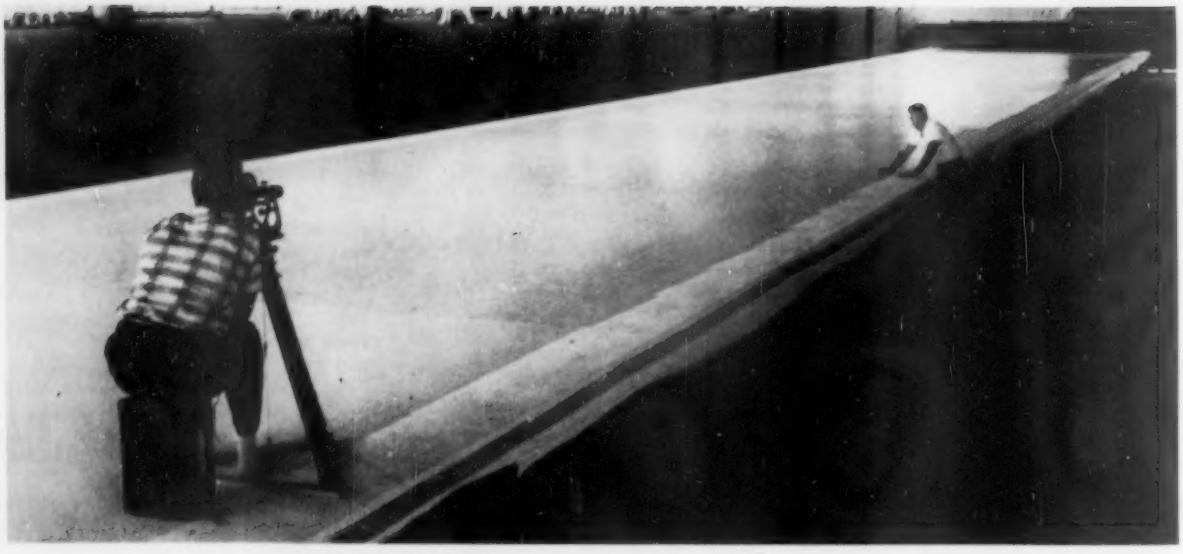
Adair plan approved . . . Meanwhile, the commission gave its blessing to another big unit and water flood in Adair Wolfcamp field which straddles the Gaines-Terry county line in West Texas.

This one takes in all of Adair's 2,844 acres and 63 producing wells and is expected to net a whopping 28,000,000 bbl. of added oil over primary recovery *(The Oil and Gas Journal, August 6, page 55).*

The flood plan calls for injecting water above and below the water-oil contact of the upper Wolfcamp at about 8,500 ft. through three input wells on the perimeter of the field.

The flood is expected to boost recovery to 53,000,000 bbl. of the 111,000,000 bbl. estimated as originally in place.

Amerada Petroleum Corp. is unit operator.



SURVEY TEAM WITH TRANSIT is needed to add trim line to huge map as . . .

Futuristic Map-Room Installation Takes Shape

DALLAS.—What is believed to be the oil industry's biggest and most advanced roller-map installation will be placed in service by a large West Coast independent this fall.

The huge system will show up-to-date field and lease ownership information on a 2,000,000-sq.-mile area or more than 1¼ billion acres.

It will include all states west of the Mississippi River, Florida, Alabama, Mississippi, Louisiana, Michigan, Illinois, Kentucky, most of British Columbia, Saskatchewan, Alberta, part of Manitoba, and Venezuela.

Work on the project was kicked off last April. Mounting was started in July and is now about 60 per cent complete.

Some of the maps already are being used in temporary quarters in a one-story building so that posting can be kept up-to-date. The maps will be moved this fall, however, and installed in a specially-designed system which will occupy most of the eleventh and twelfth floors of a newly-constructed building in Los Angeles.

The upper floor will be the map-room proper, adjacent to executive suites and conference rooms. It is L-shaped, with two walls 56 ft. wide and four walls 28 ft. wide. Eight roller maps, each 20 ft. wide, will be installed in these walls. Six additional rollers can be added in the middle of the room if needed.

The eight giant maps, the longest of them stretching 246 ft., roll from the ceiling of the twelfth floor down to an eleventh-floor drafting room, where postings are made. Switches on each floor will move the maps up or down.

If postings are being made on a map in the drafting room, a security switch arrangement prevents movement of the roller mechanism. The prospective viewer on the upper floor is notified by a red light of this condition. The roller is freed when the map has been cleared of work materials. A green light indicates it is back in service.

An electric-eye device permits the draftsman to move a map up or down simply by breaking a light beam beneath the drafting table with his foot.

Roughly 80 per cent of the regional base maps for the project were supplied by Muldrow Aerial Surveys Corp. of Midland, Tex. General Electric Corp., Vulcan, and a Los Angeles commercial decorating firm collaborated on the engineering and mechanics.

Special mounting process . . . Accurately controlled regional base maps were lithographed in black ink on high-grade imported linen. The linen was mounted on heavy, preshrunk muslin using a secretly-processed, semi-dry paste-type adhesive.

The adhesive permits unusually quick mounting without causing any deviation in the 1 in. to 4,000 ft. map scale.

Samples of the printed linen-on-muslin have been subjected to conditions simulating 25 years of wear and tear without deteriorating.

Technicians say the new procedure has cut mounting time by about 2 years.

SCALED AT 1 in. to 4,000 ft., big map offers plenty of "elbow room" for painters.

Shut-In Field Opened

Gas from Big Piney, unproductive since its discovery 18 years ago, begins flowing into Pacific Northwest system

BIG PINEY, Wyo. — The first gas started flowing to market last week from a Wyoming field which had been shut in for 18 years.

Production from Big Piney field was turned into a 51-mile lateral leading into the 1,487-mile main line now being built by Pacific Northwest Pipeline Corp. It is destined initially for markets in Oregon and Washington.

Elaborate ceremonies are planned in Portland August 16 when the Pacific Northwest system will be connected to distribution lines of Portland Gas & Coke Co. in Oregon and Washington. This will be the first major distribution system in the Pacific Northwest to receive natural gas.

The first sale of gas from the Pacific Northwest line actually was made last week, when a system serving Monticello, Utah, went into operation.

Big Piney is one of the few gas supplies along the Pacific Northwest line, now nearing completion. The line originates in the gas-rich San Juan basin and will extend to the Canadian border.

First a disappointment . . . Discovered in 1938, Big Piney is now owned 75 per cent by Belco Petroleum Corp., New York, and 25 per cent by David C. Bintliff, Houston.

Four top officials representing the pipeline company and producers opened a valve at the jointly owned Compressor Station No. 23 August 11 to turn Big Piney gas into the Pacific Northwest system. Participating in the festivities were Arthur B. Belfer, president of Belco Petroleum; Bintliff; Ray Fish, board chairman of Pacific Northwest; and C. R. Williams, vice chairman of the pipeline company's board of directors.

Big Piney production represents the first major gas purchase to enter the Pacific Northwest system. Earlier, gas from Pacific Northwest's own reserves in the San Juan basin had been used in purging and testing the line.

Gas was an unsought commodity when it was first found by oil wildcatters in the Big Piney area. It never gained much popularity until 4 years ago when Fish started discussing a major transmission line into the Pacific Northwest.

Several dry holes had been drilled in the area before Wyoming Petroleum Corp. completed the No. 1 Budd as a gas discovery in the winter of 1938. This discovery set off a drilling spree which has continued intermittently to the present. Always in the hope of finding oil, more and more wildcatters moved into the region. Up to 1952, gas has been found in commercial quantities in 11 tests, most of them ranging from about 950 to 2,850 ft. in depth.

As fast as gas wells were completed they were shut in due to the lack of transportation facilities. Many disappointed oil men sold their leases. By 1952 the gas field had been pretty well defined by seven dry holes on the east and west.

Late that year, a major portion of the field was acquired by Belfer, a New York investor. In 1953, after committing the reserves to Pacific Northwest which was still in the early planning stage, Belfer started a drilling program to enlarge Big Piney and to test other leases. That program is still going on.

Bintliff, a Houston financier, acquired a 25 per cent interest in the leases in 1955.

More drilling planned . . . Together, Belco and Bintliff now control 129,092 acres in oil and gas leases in the Sublette County block. They have 45 gas wells, including 10 dually completed. To date, they have drilled 19 dry holes in the area.

By the end of this year 25 more wells are to be completed, including 12 wildcats. Three will be in the North Piney Creek area about 17 miles northwest of present production.

Big Piney reserves are expected to total about 750 billion cubic feet by the end of this year. That is the volume committed to Pacific Northwest in two contracts negotiated by Belfer before construction started on the line.

These 20-year contracts provide for payment of 15 cents per M.c.f. during the first 5 years with increases of 1 cent per M.c.f. during each of the next three 5-year periods. There also is a provision for further price adjustments based on government indices.

Gas in the Big Piney area is found in the Almy formation of Paleocene age. At least 16 productive sands have been encountered. While looking for more gas, the operators have found fairly large oil reserves. But, reversing the trend of past years, Belfer and Bintliff have postponed development of the area's oil reserves to concentrate on natural gas.

Industry BRIEFS

NEW YORK.—Socony Mobil Oil Co., Inc., will not market three grades of gasoline. The company listed "economic factors" as the main reason, pointing out that a shift from the two-grade system would result in large capital outlays, both for the company and its distributors and dealers. Officials emphasized that its premium provides a high level of knock-free performance and that both grades contain its MC4 additive.

PITTSBURGH.—Gulf Oil Corp. has acquired more than 99 per cent of the capital stock of Warren Petroleum Corp. through a stock exchange offer which expired August 1. Gulf originally obtained 83 per cent of the Warren shares in a deal completed in March mostly on the basis of four Gulf shares for five of Warren.

LOS ANGELES—General Petroleum Corp. has purchased the Hallmark Oil Co. of San Diego. Involved in the deal were Hallmark's 10 wells in the Midway-Sunset field, Kern County, currently producing a total of 37 bbl. daily. Purchase price was not disclosed.

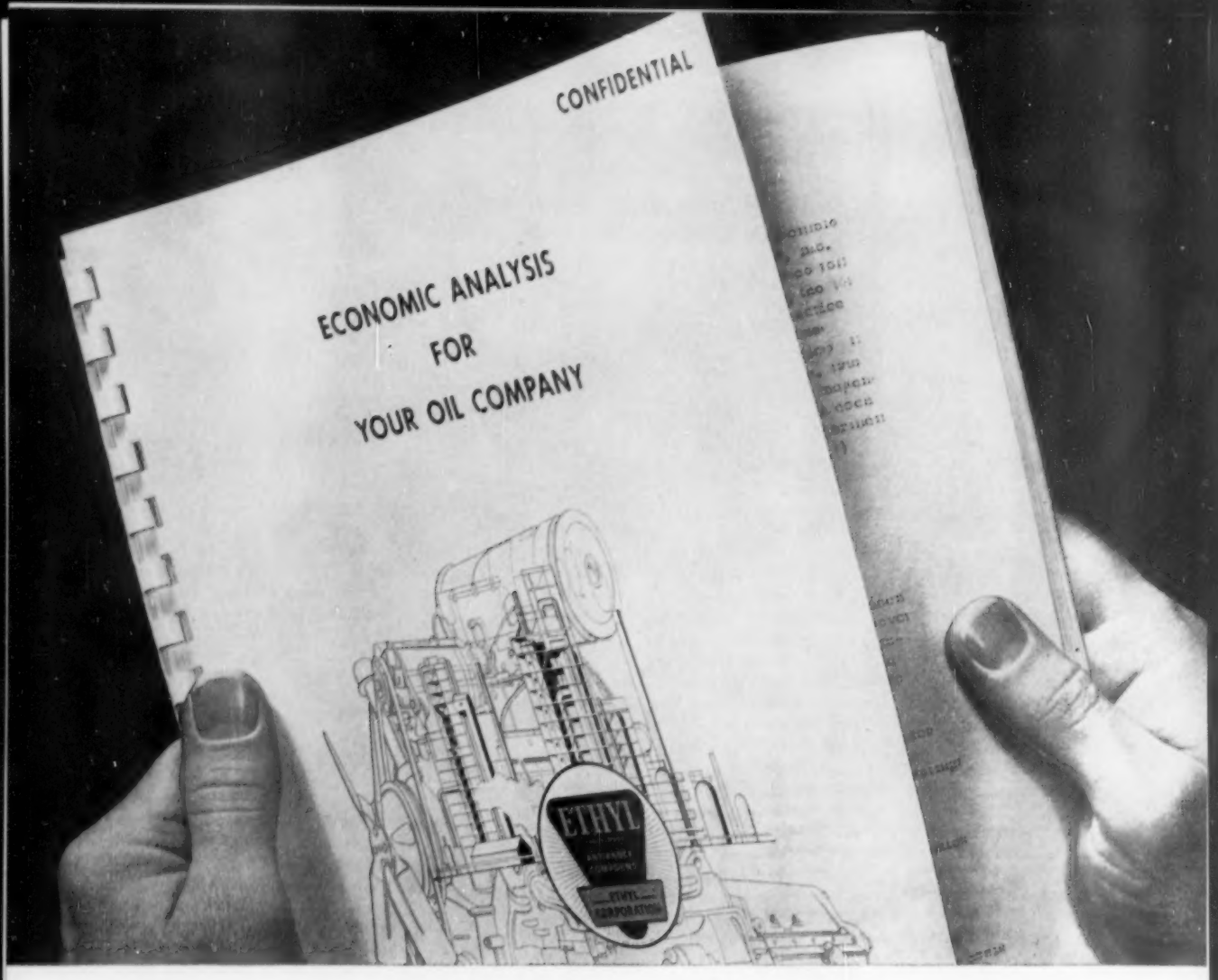
LOS ANGELES.—Standard Oil Co. of California has awarded a contract to Fluor Corp., Ltd., for the engineering and design of crude handling facilities at the El Segundo refinery. The $3,000,000 project includes three 160,000-bbl. tanks, three smaller storage tanks, and miscellaneous lines, pumps, and utilities. Construction will begin in November.

ABILENE, Tex.—Texas Calgary Co. has moved its headquarters here from New York City as a result of its merger with Petroleum Products & Producing Co.

The deal involved the entire production from the 42-well Hospah field in the San Juan basin of New Mexico. It also included oil and gas production in Canada, Montana, Arkansas, and Texas, plus an 2,000-bbl. asphalt refinery at Leuders, Tex.

CALGARY.—Westspur Pipe Line Co. has announced plans to expand its crude system on the eve of completing the 109-mile trunk line and 50 miles of gathering lines in southeastern Saskatchewan.

The line will be extended to Rosebank and Ingoldsby fields southeast of Nottingham field, Kingsford and West Kingsford fields northwest of Steelman, and Edenvale field northwest of Alida. There will be some extension in the lines serving Steelman.



Can we help you pinpoint your octane-improvement costs?

A dividend of $1,000 a day can be realized in a refinery producing 20,000 BPD of gasoline if the cost of that last octane number can be reduced 5¢ per research octane number barrel.

This is the type of cost reduction that Ethyl refinery technologists have been able to pinpoint for many refiners through economic analyses of process operations.

This assistance from Ethyl has taken various forms—from brief consultations to full-scale economic analyses. When called upon for a study, we work in close cooperation with your personnel. After the project is completed, we prepare a detailed report which summarizes and evaluates the data.

On the right-hand page you will find some examples of the type of studies we can do for you. You can enlist the services of our refinery technologists just by calling your local Ethyl representative. As always, these Ethyl services are available for the asking.

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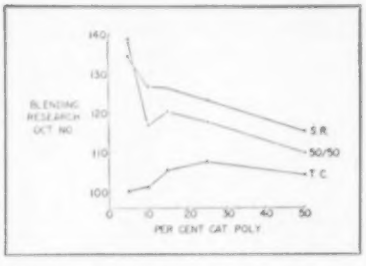
Economic Studies Ethyl Can Do For You

CATALYTIC POLYMER BLENDING BEHAVIOR



Here is a typical result of a simple blending study carried out at Detroit using laboratory facilities. Purpose of this study was to establish for the customer's use the blending behavior of catalytic polymer as a function of concentration in several refinery components.

COMPONENT BLENDING (ENGINEERING APPRAISAL)

I. INFORMATION REQUIRED OF CUSTOMER

A. Blending Basis

Component	B/D	RVP	RON Clear	RON 3M1 Gal
St. Run	1000	8.6	73.0	90.8
Th. Crack	840	7.4	75.8	87.4
Cat. Ref.	2320	6.1	84.7	95.5
Poly.	100	10.0	96.5	101.1

B. Products and Specifications
1. Volume Ratio—30% Prem., 70% Reg.
2. Volatility—Summer 9.0 RVP Max.
3. Octane Targets

These two tables are part of an engineering appraisal analyzing a refiner's octane situation. The information obtained enabled us to advise him on general solutions to his equipment and octane problems. Item 1 shows the type of information required of a refiner to make an engineering appraisal, i.e., his refinery operating basis and his product

2. DATA DEVELOPED
A. Laboratory Qualities of Individual Components
B. Inspection Data on All Blends
C. Fractionation of Specific Components

3. CALCULATIONS DEVELOPED
A. Optimum TEL
B. Optimum Premium Production
C. Maximum RON for Given TEL

4. END RESULT
A. Preparation of Report
B. Presentation of Report

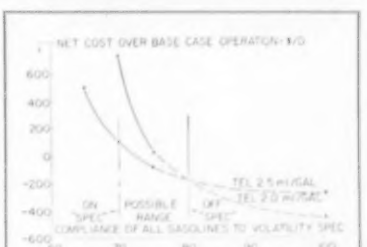
objectives. Item 2 summarizes data we developed on the components submitted to us. Item 3 gives the calculations developed. In the course of an analysis of this type we may develop optimum TEL concentration for the given conditions, optimum ratio of premium-to-regular production and maximum RON attainable for a given TEL use.

ECONOMIC ANALYSIS OF REFORMING

I. GENERAL INFORMATION
A. REFINERY
1. Crude and Gasoline Components —Quantity
2. Prem. – Reg. Gasoline – Ratio, Specifications
3. Cost Data—Prevalent Area Prices
B. LABORATORY
1. Gasoline Components—Qualities
2. Full Boil. St. Run Gasoline — Yield — End-Point, Octane, RVP Relationship
C. REFORMING
1. Products—Yield Octane Relationship
2. Operating Cost Analysis

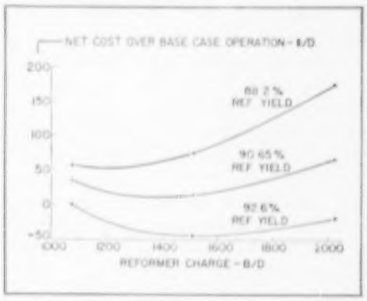
All of us realize the economic importance of TEL and the incentive for using TEL to maximum economic advantage. Outlined here is the information required to perform an over-all analysis for one of our customers. If the analysis happened to be for a refiner considering catalytic reforming, we could use typical catalytic reforming results and operating costs. Then we would construct a cost or operating pattern on which he could impose specific proposals as they are received from the process companies.

ECONOMIC ANALYSIS OF REFORMING (Constant Pool TEL Content)



We conducted this particular economic analysis to show a refiner how catalytic reforming would fit into his other operations. This figure shows cost in dollars per day vs. the per cent of available straight-run naphtha charged to the reformer. We show results at two TEL concentrations. Our studies indicated that this refiner will face a certain volatility problem. By this analysis, he learns he will have to charge between 70 and 80 per cent of his available naphtha to reforming and not get outside this range if he is to meet volatility imitations.

ECONOMIC ANALYSIS OF REFORMING (Variable Pool TEL Content)



For this customer analysis, net cost was plotted against reformer charge for various severities. Note that the minimum cost is obtained at the highest reformer yield; that is, at the lowest severity. Studies of this type illustrate the need for the refiner to study continually relative economics of TEL and reforming.

ALTERNATE USE ECONOMICS

VALUE OF CASINGHEAD

	Summer		Winter	
RVP – Casinghead	18	14	18	14
Value, ¢/gal	10.5	11.0	10.9	11.3
Effects:				
Gaso. up 1¢/gal	+0.8	+0.9	+0.9	+1.0
C_5 up 2¢/gal	+0.2	+0.1	+0.2	+0.1
Casinghead, Max. Bbls	240	230	1555	1545
Gaso. Prod. Incr., Bbls	205	215	970	1035

It is impractical for some companies to maintain a sufficient staff to permit making the many economic analyses required for most efficient gasoline operations. Recently, for a company in the South, we calculated values for certain gasoline components. (Table shows the value of casinghead gasoline.) Our refinery technology staff is in a position to make similar evaluations for you.

(Advertisement)

Adena Rules Fixed

For the first time quotas are based on oil in place

DENVER.—Oil in place under individual leases has been used for the first time to allocate production in a unitized field.

The Colorado Oil and Gas Conservation Commission applied this method rather than a per well formula in fixing a 14,000-bbl. daily allowable for Adena field, second largest in the state. Production last year averaged more than 16,000 bbl. per day.

"Although this manner of establishing the field's production potential has been used in the past by banks to appraise loan values" the commission said, "this is the first time the system has ever been used for allocating actual production."

Field-wide gas-oil ratio was limited to 1,200 cu. ft. per barrel, and no more than 16,800,000 cu. ft. may be used in producing the daily allowable. Wells with ratios exceeding 10,000:1 will be shut in. Credits will go to operators whose wells are shut in, the commission said, "because the gas saved will migrate to other leases, thus assisting over-all production."

The order also applies to wells operated by Petroleum, Inc., the lone operator refusing to go along with voluntary unitization last December.

The allowable order follows a survey in June which showed that serious bottom-hole pressure differentials were causing drainage of oil across lease lines. The result was violation of correlative rights of several owners and operators.

Primary recovery will be boosted by 10,000,000 bbl. through unit operation to around 50,000,000 bbl., it is estimated. An engineering study indicated an additional 17,000,000 bbl. could be recovered by water flooding *(The Oil and Gas Journal, January 2, page 60)*. Pure Oil Co., with one-third of Adena production, is unit operator.

T.G.T. Opens Products Line

HOUSTON.—Tennessee Gas Transmission Co. has completed a 240-mile products line to move butane and other liquefied petroleum gas from its natural-gasoline plant near Banquete, Tex., to the Houston area.

The 6-in. line is now moving isobutane to Houston, where it is shipped out in tank cars. The company is nearing completion of a fractionation plant near the Houston Ship Channel. Upon completion of this project, the L.P.G. line will transport mixed products from the Nueces County gasoline plant.

Butane will be transported through the line for use in the Petro-Tex Chemical Corp. butadiene plant near here. The butadiene plant is owned jointly by Tennessee Gas and Food Machinery & Chemical Corp. Tennessee Gas also is developing underground storage facilities for 1,250,000 bbl. of L.P.G. at the Houston terminal.

Houston Pipe Line Sold

HOUSTON.—Atlantic Refining Co. has reached an agreement to sell Houston Pipe Line Co. to Houston Natural Gas Corp.

Under terms of an "agreement in principle" announced last week, Atlantic will realize $37,684,000 for the recently acquired pipeline facilities. A former wholly owned subsidiary of Houston Oil Co. of Texas, Houston Pipe Line operates about 761 miles of gas-transmission lines and 408 miles of gathering and distribution lines along the Texas Gulf Coast.

Atlantic paid approximately $200,000,000 for the combined assets of Houston Oil and its pipeline subsidiary.

Purchase of the newly acquired facilities virtually doubles Houston Natural's assets. The utility company has for years depended on Houston Pipe Line for much of its gas supply.

The agreement announced last week provides that Houston Natural shall pay $26,000,000 in cash for the pipeline company stock and assume a long term debt of $11,684,000. Transfer of the property is expected to be delayed until December, after legal aspects of the purchase have been worked out.

Texans Leasing In Alaska

FAIRBANKS, Alaska.—The Yukon River area of Alaska gold rush fame may now come into a big play for oil.

Texota Oil Co., controlled by F. Kirk Johnson of Fort Worth, Tex., is taking an interest in the Yukon. Oil leases on more than 100,000 acres, lying between Nulato and Koyukuk, were filed early this month. They were filed in the names of Mrs. Earl Henderson, wife of the president of Texota, Thomas Hiestand, and David Stout.

Henderson said geologists have found "definite oil structures extending north and south of the Yukon and also lying beneath the river itself."

Johnson and Brooks Scanlon already have put together a 400,000-acre block north of the Yukon on the Kateel River and near the new lease. Both holdings are about 300 miles west of Fairbanks *(The Oil and Gas Journal, August 29, 1955, page 52)*.

Tulsa Firm Is Sold

Anchor Petroleum officials purchase Western Supply

TULSA.—F. W. Dye, president of Western Supply Co., Tulsa, has sold his stock control of the company to a trio of prominent Tulsa oil and business men. Purchasers were W. A. Baden, B. B. Blair, and L. F. Rooney. Sale price was not disclosed.

Western is a pioneer manufacturer of process equipment and distributor of oil-field equipment. The three buyers are all executives of Anchor Petroleum Co., Tulsa.

Dye said the company will continue to operate under its present personnel and policies. He will remain on as board chairman and chief executive officer. Other Western officers are Mylon C. Jacobs, vice president of the supply division; James E. Hughes, vice president of the heat-exchanger division; and John D. Miller, secretary-treasurer.

Dye has been an executive of the company since its organization in 1907. He became president in 1935 when he gained full stock control through purchase of interest of the late J. E. Duffey.

Western in its early days manufactured nearly all the component parts for cable tool drilling rigs. It later developed and manufactured the Hardenburg underreamer, the Crotto wireline clamp, and developed an air-actuated oil-well pump. About 1937 the company built pipeline heat exchangers and later manufactured heat exchangers for the gasoline, refining, and petrochemical industries.

Through its supply division, Western is distributor for major pipe, valve, and fitting manufacturers. It has sales offices at Pampa, Greggton, Tyler, Dallas, and Houston, Tex.

Gulf Coast Wildcat Hits

NEW ORLEANS.—A gas-distillate field has been discovered by Continental Oil Co. about 20 miles southeast of here in the Alligator Pass area of Plaquemines Parish.

The discovery well, 1 Delacroix, flowed 469 bbl. of 46.8°-gravity distillate and 4,902 M.c.f. of gas per day through ¼-in. choke. Production is from three intervals in the Miocene between 11,494 and 11,598 ft. Tubing pressure was 5,425 psi. and gas-oil ratio of 10,450:1.

Nearest production is more than 3 miles south of the discovery. Continental has a block of about 10,000 acres in the area.

Suez Fires Arab Unrest

Nationalization demands now being voiced for Middle East oil; this could be more tragic to West than loss of canal

THE international oil industry harvested its first crop of trouble from the Suez question last week. Long smouldering unrest in the oil-rich Middle East showed signs of flaming into a fire that could prove tragic for western interests.

Threats of force by western powers to keep the Suez Canal under international control after the waterway was nationalized by Egypt proved the catalyst for the new developments. Here's how they shape up:

. . . The Arab world has lined up solidly behind Egypt's Col. Gamal Abdel Nasser, at least publicly. The Egyptian president's action in defying the West has done more to close Arab ranks than anything in recent history.

. . . Nationalization demands for oil within their borders are being made by other Arab countries. Many of these are far more important to the western world's oil supply than the Suez Canal.

As usual, the most vocal demands are from the smaller have-not countries, like Syria and Lebanon, which have been left out of the oil riches. The idea isn't new. But because of the tinderbox atmosphere in the entire Middle East it is being regarded more seriously by the West than ever before.

Big oil huddle . . . Thirteen international oil companies conferred with Hugh A. Stewart of the Department of Interior in New York last week.

It was a closed session, but it is known that high on the agenda was the matter of an oil supply if the Middle East should be cut off by any action in the Arab world. The industry concedes that the United States can take care of herself, but western Europe is another matter.

Nine of the companies which met with the Interior Department's Oil and Gas Division director have a stake in Middle East oil. The other four were large-scale producers in Venezuela. Some fell in both groups.

A vital issue which Stewart's group undoubtedly discussed was the problem of supplying Europe's dollar-short countries with oil from outside the sterling area. The industry thinks it could sustain Europe on an emergency basis with oil supplies from the United States and Latin America. But the European purchasers do not have the dollars to pay for the oil. Europe's oil currency is sterling.

Other nationalistic rumblings . . . In spite of Nasser's effort to solidify the Arab world behind him as a leader, there have always been at least two opposing camps in the Middle East, and often three.

Both Saudi Arabia and Iraq have regarded Nasser with suspicion. Kuwait, under the watchful eye of the British, has remained largely noncommittal about Nasser.

The Suez Canal seizure apparently has swept aside many of these differences. Saudi Arabia and Iraq have both publicly backed Nasser's stand. In their first flush of jubilation that one of their number has talked back to the West, elements throughout the Arab world are calling for nationalization of all Middle East oil.

Ironically, the one man who tried such a movement, and ultimately failed, was released from prison almost unnoticed in all the latest furor. Dr. Mohammed Mossadegh, the man who drove the British from Iran and halted the flow of oil from one of the Middle East's richest producing areas for 3 years, walked out of jail last week. He served 3 years for trying to overthrow Iran's shah in 1953.

It was not until after Mossadegh was ousted from power in Iran that the western world was able to reenter Iran and once again move Iranian oil into world markets. In the final analysis both Mossadegh and his enemy, the British, lost. Anglo-Iranian Oil Co. (now British Petroleum Co.) lost its exclusive concession in Iran. B.P. now has only a 40 per cent interest in Iranian oil. The remainder is held by an international consortium.

Pipeline troubles . . . In addition to talk in Syria and Lebanon of nationalizing the two pipeline systems to the eastern Mediterranean, there were threats of cutting these lines to support Nasser.

Syrian socialists announced they would cut the lines if the British and French use force to impose their will on Egypt. Such an action could swing both Iraq and Saudi Arabia back to the western side very quickly.

Influential Iraqis said last week that such a move would mean an Iraq invasion of Syria. Iraq's economy is oil. Any interruption of the flow of her oil to the West would be disastrous. The same is true of Saudi Arabia.

The pipeline systems operated by Iraq Petroleum Co., Ltd., and Trans-Arabian Pipeline Co., have troubles aside from the Suez dispute. Last week Tapline accused the Lebanese Government of reneging on its legal agreement when it imposed income taxes on all foreign companies. Tapline said it had "regretfully" come to the conclusion that the new retroactive tax law violates its 10-year-old agreement with Lebanon for income tax-free operation.

Tapline denied it has withdrawn its offer to share the line's profits with Saudi Arabia, Lebanon, Syria, and Jordan, but added, "the new law creates a situation in which negotiations with Lebanon on this proposal cannot be continued."

I.P.C. has long been involved in a dispute with Lebanon over the amount it should pay the country for moving oil across its borders by pipeline. The new tax law is regarded as a means of whipping both companies into line and forcing agreement to Lebanon demands.

The two pipeline systems move about 900,000 bbl. of crude daily from Iraq and Saudi Arabian fields to eastern Mediterranean ports where it is shipped by tanker to western Europe and the United States. The Suez Canal carries another 1,500,000 bbl. daily to the same markets.

In the midst of all the new Arab vs. western world lineup, Israel, the old enemy of the Arab, was almost forgotten. That is not expected to last. The Israeli Government said last week that it has resumed negotiations with unnamed British and American oil companies on a plan for a pipeline in Israel.

The line as proposed would traverse Israel from the Red Sea port of Eilat to Haifa, a distance of 273 miles. The Israelis say tankers could unload at the Red Sea tip of Israel, and the oil could be moved through the 16-in. line to Haifa and the refinery, bypassing the Suez Canal.

The Arab oil-producing nations will not allow shipments of Middle East crude to Haifa now. Egypt banned Israel shipping from the Suez Canal. The same embargo would certainly apply to crude for the pipeline.

Venezuela Lures Indiana

Move underlines company's expansion into foreign field; new American combine wins big Block 10 lake concession

STANDARD OIL CO. (Ind.) last week revealed plans for a Venezuelan subsidiary to seek concessions in the country where it once held important acreage.

The Indiana Standard move came as a new combine of independents were reported to have obtained Lake Maracaibo acreage and rumors concerning other grants multiplied. The Venezuelan Government still has made no official announcement.

The latest combine reported as successful Maracaibo bidders was the Venezuelan American Independent Oil Producers Co., Inc. The application for this new firm was printed last week in the official government gazette. Reports from Caracas indicated the new group made a successful bid for Block 10 of the original 11 lake blocks offerred by Venezuela *(The Oil and Gas Journal, July 16, page 62).*

Block 10 was one of three 10,000-hectare tracts for which there were no successful bids in the original offering early in June.

Indiana Standard decision . . . The disclosure that Indiana Standard is going to reenter Venezuela was made by Jack Hamilton, the company's land division manager in Caracas. Hamilton said the Venezuelan subsidiary will seek new concessions in the country which ranks second only to the U. S. in oil production.

Indiana once had important holdings in Venezuela. It first started operations there in the 1920's. It sold out to Standard Oil Co. (N. J.) about 10 years later. The former Indiana properties are now operated by Creole Petroleum Corp., a Jersey Standard subsidiary.

Indiana Standard's new interest in developing foreign production to compete with importers started during the past year when it entered the Cuban play. Stanolind Oil & Gas Co., its producing subsidiary, launched a $10-million exploration program there. Soon afterward Stanolind took over an exclusive concession covering the island of Jamaica and its tidelands and is drilling its first test.

The announcement of a Venezuelan subsidiary is considered its most important move yet in the drive to become established in the foreign field.

Grant confirmed . . . Sohio Petroleum Co. last week became the first company to announce officially that it was awarded acreage in the Lake Maracaibo bidding which marked Venezuela's first issuance of new concessions in 11 years.

Sohio announced that the four-company combine of which it is a member received a central lake block of 10,000 hectares. Others in the group are Hancock Oil Co., Pure Oil Co., and Signal Oil & Gas Co.

Sohio described its acreage as in the east-central area of the lake bounded on both the north and east by concessions under active development by other companies. This is Block 4 *(The Oil and Gas Journal, July 16, page 62).* The four companies reportedly paid more than $1,100 an acre for the tract.

Gazette names bidders . . . Other companies involved in the bidding for Venezuela acreage have withheld any announcement concerning the concessions pending formal government action.

A number of these have been revealed, however, in recent publications of the government gazette. Such publication is tantamount to acceptance and is regarded merely as a legal formality preceding the actual award.

Included in the applications published by the gazette were two lake blocks sought by Cia. Shell de Venezuela; two by Mene Grande Oil Co. (Gulf); one by Creole; and one by Sun Oil Co. and Atlantic Refining Co. In addition Mene Grande applications for national-reserve acreage in the lake and land acreage near the Colombian border have been published in the past week.

Cuban Farmout Deals Sought

American Leduc Petroleums, Ltd., parent company of Cuban Canadian Petroleum Corp., revealed last week at Edmonton it is negotiating with three companies for Cuban farmout deals similar to the one with Esso Standard Oil Co., S.A.

Lowell M. Birrell, American Leduc chairman, said his firm is talking with Shell, Sun, and Union Oil Co. relative to acreage the Cuban subsidiary holds. Earlier this year the company signed over exploration rights on 75 per cent of 926,525 acres to Esso *(The Oil and Gas Journal, April 23, page 93).*

Birrell also revealed that Canadian has started an offset well 2,100 ft. northeast of Cuban American Drilling & Exploration Co. 1 Catalina *(The Oil and Gas Journal July 23, page 74).* Cuban Canadian's well is being drilled by C. J. Simpson Drilling Co.

Israeli Oil Sold

Government to buy output from country's first field

THE Israeli Government, through its ministry of finance, last week signed a contract with two oil companies to purchase all of the crude produced at Heletz field.

Heletz, discovered last October by Lapidoth Israel Oil Co., Ltd., and Israel Oil Prospectors, Ltd., is producing about 600 bbl. daily from three wells. Three more wells are being drilled in the country's first oil field. Officials of the two companies estimate they have reserves of about 50,000,000 bbl. *(The Oil and Gas Journal, May 21, page 146).*

The 32°-gravity Heletz crude is being moved by pipeline from the field to the railroad about 5 miles away and then hauled by tank car to the Haifa refinery. The field has produced about 80,000 bbl. since the discovery.

The output is being stored at the refinery until enough accumulates to warrant refining adjustments to best process the Israeli crude. The refinery is operating on Russian and Venezuela crude to meet Israel's internal consumption *(The Oil and Gas Journal, July 23, page 73).*

Aramco Comes Under Fire

Arabian American Oil Co., a few months ago the whipping boy of the British in the Middle East, came under fire from a new quarter last week as the American Jewish Congress charged the company with racial discrimination.

Shad Polier, vice president of the A.J.C., filed a complaint before the New York State Commission Against Discrimination. He said Aramco refuses to hire Jews for either its Saudi Arabian or New York operations.

The company answered that any restrictions regarding "entry into Saudi Arabia are imposed by the Saudi Arabian Government and are entirely outside the company's control."

Aramco previously injected the "no control" defense against British charges that the company's oil royalties to Saudi Arabia were being used for antiwestern propaganda.

BIG RIG drilling in Sinkiang Desert area of the Tzungaria basin results in . . .

NEW OIL from 10 wells, making . . .

Karamai: China's Biggest Oil Field

THE Chinese Communist Government has revealed a new oil field in extreme northwest China. It is tagged the biggest field in the country.

Photographs released in this country by the Eastphoto agency locate the field near Karamai, in the Tzungaria basin of northern Sinkiang.

Characteristically, the Chinese gave no production figures on the new field. They did claim, however, that it extends over "thousands of square kilometers."

Desert drilling . . . Official reports say that 10 producing wells have been completed in an area that a year ago was nothing but desert.

The reports say 15 wells have been drilled and the drilling program is progressing.

The newly unveiled oil field is in the same region of China as the older Tushantzu field in the Wusu area of Sinkiang Province. But it is apparently even farther north. The older field was turned over to the Chinese Reds more than a year ago by the Russians who had operated it in a joint venture with the Chinese.

Cloak of secrecy . . . The last authentic information to reach the western world from that remote area is 13 years old.

When the Russians first moved out of the Tushantzu field in 1943, they had been operating a small topping plant, which they dismantled. There were four wells in the field capable of producing a total of about 300 bbl. daily. After the communists took over China, the Russians reentered the area and until 18 months ago carried on small-scale operations with the Chinese in the whole general region.

The Chinese, like the Russians, do not reveal production data on their petroleum operations. Claims of greatly increased production coming from China would indicate, however, that output has probably quadrupled since 1953 when the country produced an estimated 3,500 bbl. daily.

Gobi Desert explored . . . The current Chinese 5-year-plan, which was started last year, has set a goal of more than 40,000 bbl. daily production for the country by 1960.

The Chinese, who say they now have drilling equipment capable of making 10,000-ft. depths, anticipate help from other communist countries in reaching the goal.

Last week the Chinese People's Republic announced that a party of 45 Hungarian geophysicists are en route to the Gobi Desert area of China for a 2-year prospecting survey.

The Chinese Government concedes that no adequate estimate of the country's oil reserves is available, but reports from China, via Japan, last week indicate that reserve estimates range all the way up to 17,000,000,000 bbl. A faculty member of China's People's University recently voiced the claim that China should be ranked third among the nations of the world in oil reserves. He did not identify the first two countries in his ranking.

The government claims that test drilling during 1955 revealed 100 oil-bearing formations in Tsinhai, Sinkiang, Szechwan, and Kansu provinces.

Pakistan Wildcat Spudded

Standard Vacuum Oil Co. last week spudded in its first wildcat in West Pakistan about 130 miles east of Karachi and 8 miles west of the village of Jhudo.

Digh 1 is on a 7,200-sq. mile block covered by a 1954 agreement under which the Pakistan Government pays 25 per cent of the cost of the operation in return for a similar interest in any production. The well is being drilled by Southeastern Asia Drilling Co., Dallas.

The rank wildcat is the second major drilling operation by an American company in Pakistan. Hunt International Oil Co.'s deep test of the Dahk anticline in the Makran coastal area was drilling below 3,500 ft.

BAKU PLANT mass produces drilling platforms as . . .

Russia Pushes Caspian Offshore Oil Hunt

IMPORTANCE which Russia attaches to its offshore drilling program in the Caspian Sea is underscored by the photograph above. It shows the mass-production technique used in building offshore drilling platforms.

Sovfoto, the agency which distributed the pictures, reports it was taken at the October Revolution Engineering plant in Baku. It says the metal islands being assembled are used by Caspian oil workers in drilling for seabed oil. Derricks and oil drilling equipment can be seen at work in the offshore area in background.

The Caspian offshore area is considered one of Russia's newest sources of oil. It is an extension of the old Baku area, one of the world's oldest oil-producing regions.

Austria Revamping Petroleum Setup

THE Austrian oil industry—center of political controversy since Russian withdrawal last year—may be headed for calmer weather.

This is indicated by the latest decision of the Austrian mineral oil administration. It will try to peg annual crude production to present levels—about 65,000 bbl. daily.

To maintain this goal in 1956, the administration budgeted $9,750,000 for field development and exploration work this year. It plans to drill 116 field wells, 27 step outs, and 14 wildcats.

New operation . . . On the political front, the conservative people's party and the socialists have agreed on a revised set up for running the industry.

The fields will be operated by a company in which the government is the stockholder. The board of directors will consist of government ministers. Conservative Chancellor Julius Raab will have the deciding vote in case of an evenly split vote.

Previously, the fields were under control of Socialist Karl Waldbrunner, head of the ministry of transport and nationalized industries.

Under the new arrangement, the government as a whole will deal with claims by private companies regarding the fields. Most of them are located on concessions held by companies when Germany took over in 1938. The new government plan will not affect other concessions held by companies.

Production tax . . . In another development, the government decided to revise the tax structure of the industry.

A production tax is to be levied on output from government-held fields. The purpose is to make the fields competitive with private fields.

Austria so far has shipped about 8,000,000 bbl. of crude to Russia as reparations under terms of the state treaty. Another 700,000 bbl. are due for shipment by the end of this month.

Sumatra Deal Made

Operating accord reached by Shell Group, Indonesia

REPORTS from Jakarta, Indonesia, last week indicated the Royal Dutch-Shell Group and the Indonesian Government have reached an agreement for operating the oil fields in Northern Sumatra.

The 10 northern fields were producing about 20,000 bbl. daily of high-gravity crude before World War II. After the Japanese occupation and later the Indonesian drive for independence, the fields were never returned to the Shell operating company.

According to unofficial reports from Indonesia, the fields will be operated by the Netherlands Indonesian Petroleum Co. (N.I.A.M.) with the Shell group and the Indonesian Government having equal ownership. The concession area is to be enlarged and the term extended to the year 2000.

It has been estimated that it will take at least $16 million to rebuild the fields and carry on necessary further exploration. It is reported in Jakarta that the Shell company will furnish capital in return for one-eighth of production.

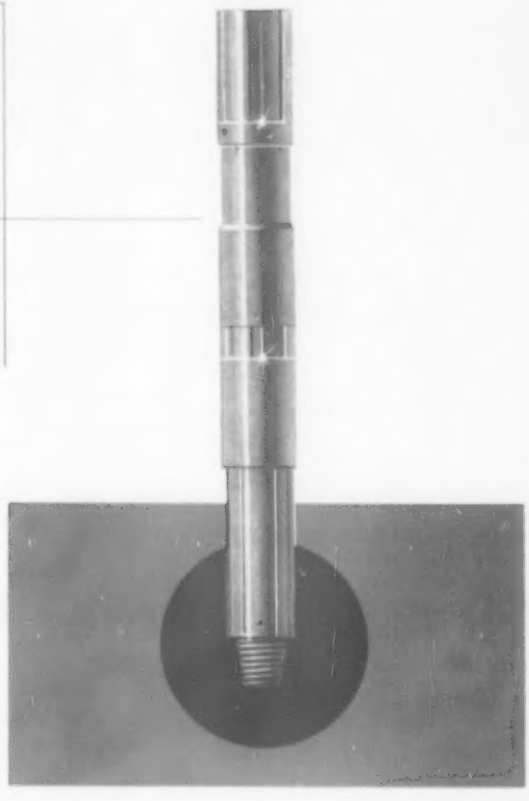
First Turkish Test Planned

Gilliland Oil Co. of Los Angeles plans to spud in the first test by an American oil company in Turkey the first of next month.

A Drilling & Exploration Co. rig is en route from Houston to Gilliland's 123,500-acre lease on the Gulf of Iskenderun. The first test will be slant-drilled under the Mediterranean from an onshore site. The wildcat will be drilled to 5,000 ft.

SAVES DOWN TIME WITH RELIABLE RESULTS!

HALLIBURTON'S
HYDRO-SPRING TESTER

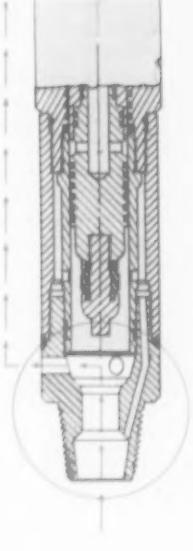


A reliable test is of vital importance, affecting decisions as to further development and completion. That's the kind you get... quickly and easily... with Halliburton's HYDRO-SPRING TESTER.

The locked-open By-Pass allows tools to be lowered with speed and ease and helps to eliminate damage to formation and packer. This important feature is especially helpful in getting the packer on bottom with a minimum of packer drag or drill pipe spudding.

AIDS AGAINST FORMATION BREAKDOWN

The By-Pass aids the packer in squeezing through tight spots caused by filter cake and thus reduces pressure build-up below the packer. It also helps prevent the forcing of mud into the formation being tested. Pressure is equalized above and below the packer until the Hydro-Spring Tester opens.



TIMED ACTION HELPS PREVENT PREMATURE OPENING

The Hydro-Spring Tester is opened by setting down weight... and closed when weight is removed. However, a *time interval*, determined by the amount of weight set down, helps prevent premature opening of the tester, particularly if a bridge is hit. This also allows the packer to expand before the tester opens. At the end of the time interval, the tester valve opens quickly and completely. It closes immediately when weight is removed. Picking up weight causes the By-Pass Valve to open, equalizing fluid to ease both packer and string removal with a minimum of lost time and difficulty, and with less strain on the derrick.

When that critical time arrives and the well is ready for test, you want to know its potential quickly and accurately. Halliburton's Hydro-Spring Tester helps you arrive at decisions for further development with the satisfaction that comes when you know you have the most reliable test. It's one of the many reasons why Halliburton's *best for your drill stem test*. For all the reasons, just phone your local or division office of the Halliburton Oil Well Cementing Company.

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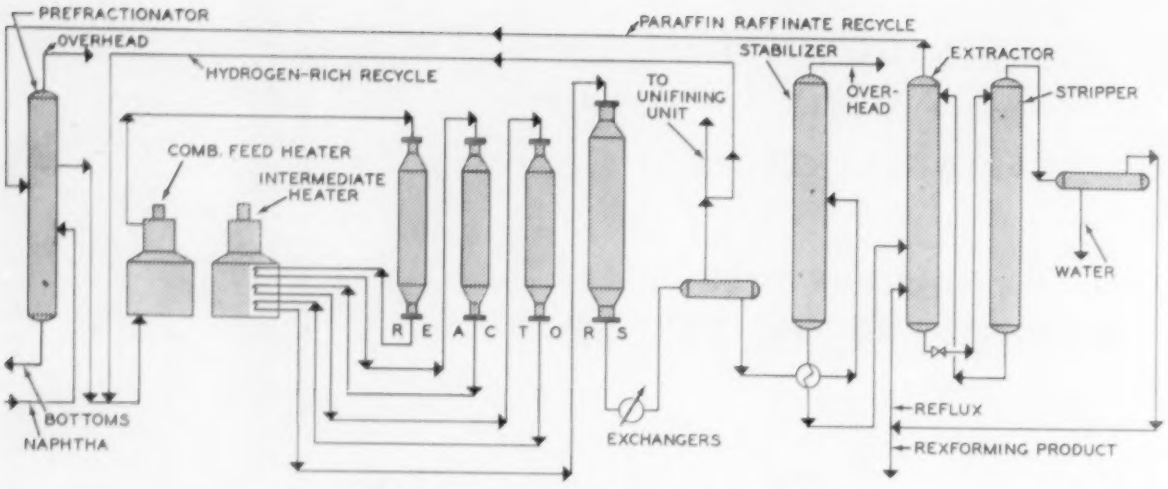


SCHEMATIC FLOW SHEET of Aurora Rexformer. Fig. 1.

First Rexformer Goes on Stream

AURORA GASOLINE CO. has placed the world's first commercial Rexforming unit in operation at its Detroit refinery. Charging 5,500 bbl. per stream day of fresh feed, the unit is producing a debutanized product of 410° F. end point which tests 98 R.O.N. unleaded. This super-fuel, when leaded with 3 ml. TEL per gallon, is rated at over 102 octane on the tentatively adopted Wiese (General Motors) Scale.

Flow scheme . . . A schematic flow diagram of the Aurora Rexformer is shown in Fig. 1. All the major vessels except those in the solvent extraction section—i.e., the extraction column, solvent stripper, and associated auxiliary equipment—were a part of a 4,500-bbl. per stream day (design capacity) Platforming unit which was installed in the refinery in 1951. The total reactor liquid charge capacity was gradually increased in the several revisions to this unit which occurred in the succeeding 4 years until, by the middle of 1955, the capacity had reached 7,000 bbl. per stream day.

The basic 7,000-bbl. per stream day Platforming unit was modified, according to designs furnished by Universal Oil Products Co., to a 5,500-bbl. per stream day (fresh feed) Rexforming unit. The Detroit refinery staff erected the required solvent-extraction facilities to convert the operation to Rexforming, making the necessary tie-ins and changing to new catalyst in a single 6-day period. After the tie-ins were completed, the unit continued to run as a Platforming unit until preparations were completed for shifting to the Rexforming operation.

The heart cut 180°-380° F. charge to Rexforming is made from a Mid-Continent naphtha as a sidestream on the reboiler prefractionator. Also entering the prefractionator with the fresh feed and for the most part appearing in the sidecut is the paraffinic raffinate from the solvent extraction step occurring later in the process. As it enters the catalytic section, the charge consists of approximately 5,500 bbl. per stream day of the virgin feed material and 1,500 bbl. per stream day of paraffinic recycle, making a total of 7,000 bbl. per stream day.

The prefractionator bottom product is a small quantity of heavy naphtha and is utilized elsewhere in the refinery. The overhead consists of pentanes and lighter hydrocarbons, and goes to light ends recovery.

The charge proceeds through the preheater and catalytic section exactly as it did in the Platforming flow sequence. The reaction conditions in Rexforming, however, are far milder than those required to reach an equivalent octane rating by Platforming on a once-through basis. A standard Platforming catalyst is used.

Reactor conditions . . . One of the major differences between operating the catalytic section for Rexforming, as opposed to Platforming, is in adjusting reactor conditions to the optimum for the conversion of the hydrocarbons in the total reactor feed into compounds of high-octane ratings, and to produce the desired amount of paraffinic recycle which is separated in a subsequent step.

The four-reactor design is used at Aurora. It has the usual interheat provisions between reactor beds. The effluent from the last reactor, after heat exchange and cooling, is flashed in a separator to remove the hydrogen-rich gas; the liquid remaining is then stabilized. In the Aurora operation this fractionation amounts to debutanizing, and the butanes and lighter overhead product is sent to the gas-recovery facility previously mentioned.

The hydrogen-rich gas from the separator is split into two streams. One portion is recompressed and returned to the reactor section via the hydrocarbon charge stream just ahead of the heater. Since the virgin feed to this unit is not desulfurized, hydrogen sulfide would tend to concentrate in this recycled hydrogen stream so, to prevent this, an amine treater is used to remove the unwanted H_2S.

The other stream is the net-hydrogen make and is consumed in the Unifining of a heavy oil which forms part of the feed to catalytic cracking. Any excess hydrogen is sent to gas recovery, also.

The stabilized reformate from the catalytic section has an octane rating of about 86-88 Research, clear. It will increase to 95-96 octane with 3 ml. TEL per gal. This is comparable in quality with the product from this section when it was operated as a Platformer.

Extraction . . . The stabilized reactor effluent is charged to a specially de-

signed extraction tower. Here, in countercurrent flow, it is intimately contacted with an aqueous solution of glycol. The exact composition of the solvent, the temperature of extraction and the solvent-to-charge ratio are controlled so that all the high-boiling paraffinic constituents in the charge to extraction pass from this column as an overhead product, the so-called raffinate. The bottom product, or extract phase, is made up of the solvent plus the desirable aromatic compounds and the low-boiling, predominantly high-octane paraffins.

The product is separated from the solvent in the solvent stripper. This column also is carefully controlled, in this case to avoid taking any of the glycol overhead with the product and, at the same time, to assure that the solvent stream leaving at the bottom is of the desired composition for return to the extractor.

Properties of the combined feed to the reactor and the product are presented in Table 1. Because it contains most of the recycled raffinate, high in paraffins, the composition of the combined feed is therefore distorted and should not be taken as typically that of a Mid-Continent naphtha.

The debutanized product from the solvent stripper section is ready for blending.

This product clearly demonstrates some of the benefits to the refiner which can be achieved readily by Rexforming. For instance, the Platforming product formerly made on this unit, before conversion to Rexforming, had a clear F-1 rating of about 87; with 3 ml. TEL per gal. it will test approximately 96-97 R.O.N. According to Faust and Bierbaum, and others, a motor fuel of this quality will satisfy about 95 per cent of the new engines which went on the road in 1955 and early 1956, or are expected later this year and in 1957.

Product yields . . . A yield based on fresh feed of about 81 per cent can be achieved. In the once-through Platforming of naphthas to 100 R.O.N., leaded, reported by Read and Weinert, much more severe processing conditions were used. The Aurora Rexformer is expected to have a catalyst life on the order of 80 bbl. of reactor charge per pound of catalyst.

This moderately severe catalytic reforming is a feature of Rexforming and comes about because the recycling of paraffins makes it unnecessary to secure high concentrations of the aromatics in the effluent from the reforming section.

The good quality of the product comes from the concentration in it of the aromatics and the high-octane, low-boiling paraffins as a result of solvent extraction. The low-octane, high-boiling paraffins are selectively insoluble in the solvent extraction step. These hydrocarbons, however, are the easiest of the paraffins to convert to aromatics by dehydrocyclization and therefore are continuously returned to the catalyst as recycle.

At the same time, excluding the low-octane paraffins makes it possible for it to have a high-octane rating without requiring a high concentration of aromatics to compensate for the low-octane materials. Furthermore, the catalytic reforming step is operated for the optimum dehydrocyclization of paraffins and dehydrogenation of naphthenes to aromatics, as well as other desired reactions.

Octane studies . . . The effect of the presence of high-boiling low-octane paraffins on the quality of a catalytic reformate may be better visualized by a study of Table 2, which gives the octane ratings of the various fractions in the nonaromatic portion of a Platforming product from a Mid-Continent naphtha. The material boiling below 142° F. does not impose a serious octane penalty on the final product, although this is of lower antiknock quality than the average of the Platformate from which it was extracted.

The cut boiling between 142° and 151° F. might not be intolerable in some refinery-gasoline-blending schemes although it is still lower in octane rating than the fractions boiling below 142° F. However, the remaining nonaromatic fractions obviously possess serious octane deficiencies. This illustrates that the higher-boiling paraffins generally have the lowest octane ratings.

These, in particular, predominate in the nonaromatics which are not miscible with the solvent and thus are returned to process as recycle in Rexforming.

High-purity chemicals as yet are not economically feasible for use in motor fuels. This brings out other inherent advantages of Rexforming, because: (1) the solvent extraction step need not be so precise as to recover all the aromatics and naphthenes in the reactor effluent; and (2) there is no reason why the product should not contain an appreciable portion of low-boiling high-octane paraffins. This makes it possible to simplify considerably the solvent extraction system in comparison with a Udex unit, for example, both operationally and constructionwise.

Changing operations . . . Aurora could operate its Rexformer another way, if it wished. In this case solvent extraction conditions could be adjusted so that substantially all the aromatics would be included in the extract, and reforming conditions could be made sufficiently severe to dehydrogenate all the naphthenes. The raffinate from the unit would then become almost 100 per cent paraffinic and suitable for use as a solvent or a blending agent in jet fuels. The Rexforming product yield naturally would decrease, but the fresh feed capacity of the unit would be greater.

Aurora's Rexforming unit was brought on stream with considerable ease. The new extraction facilities were placed into operation, processing the stabilized reactor effluent from the former Platforming reaction section. After solvent circulation was established, the effluent to be extracted was cut in and extractor conditions then adjusted until a Rexformate was produced having the desired octane rating. This took about 48 hours.

As soon as the production of raffinate commenced, it was recycled to the catalytic reforming section and corresponding reductions were made in the volume of fresh charge to the unit until design flows were reached.

TABLE 1 — PROPERTIES OF REACTOR FEED AND PRODUCT

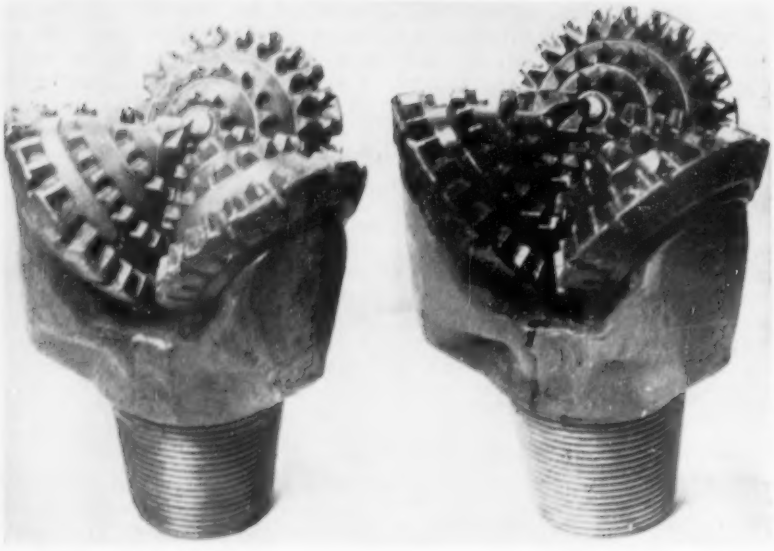
	Reactor combined feed	Debutanized product
Gravity, °F.	56-58	42
A.S.T.M. distillation:		
I.b.p.	180	110
10 per cent	215	160
30 per cent	240	210
50 per cent	260	240
70 per cent	287	275
90 per cent	334	330
E.p.	380	410
Sulfur, weight per cent	0.055	0.001
Hydrocarbon type, volume per cent:		
Paraffin	60.5	35
Olefin	Trace	0
Naphthene	33.5	5
Aromatic	6.0	60
R.v.p.		3.6
Octane rating:		
Research, clear		98.0
+3 ml. TEL		*102.4
Yield, volume per cent feed, estimated		81.0

*Wiese extended octane scale.

TABLE 2—OCTANE RATINGS OF NONAROMATICS FROM A CATALYTIC REFORMATE

Fraction No.	Fraction boiling range, °F.	Fraction volume per cent of total	F-1 clear octane No.
1	Up to 115	14.4	
2	115-142	9.9	80.5
3	142-151	10.0	68.7
4	151-157	10.0	47.4
5	157-194	9.9	63.3
6	194-199	10.2	55.6
7	199-219	8.8	18.6
8	219-261	13.0	35.4
9	261-306	8.5	9.3
10	306-349	3.9	3.8
11	Bottoms	1.4	(*)
		100.0	

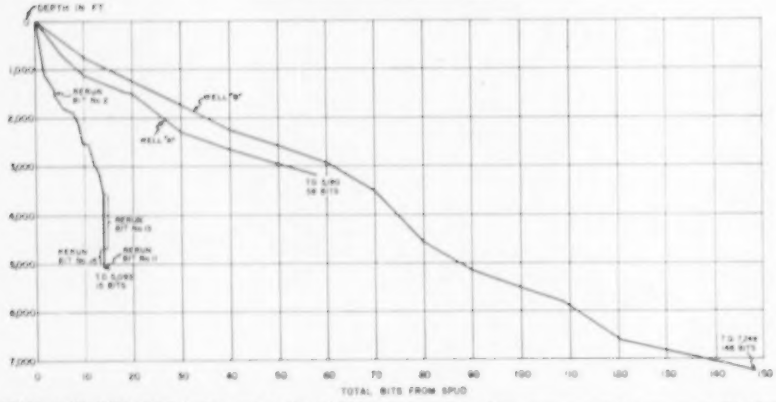
*Not determined.



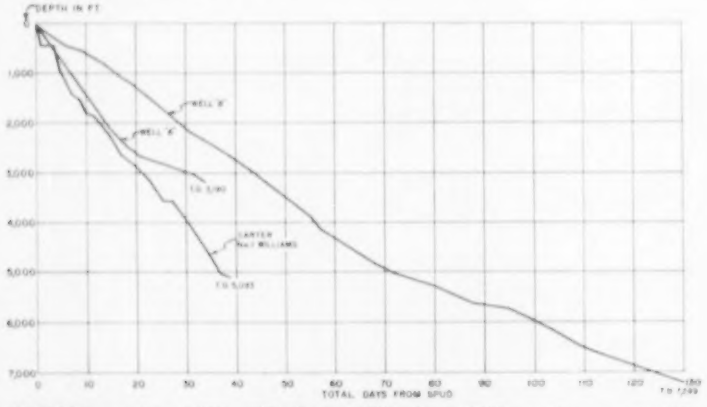
Which one of these bits was

On Bottom 201¼ Hours?

by Norman S. Morrisey
Drilling-Development Editor



THE AIR-DRILLED hole used only 15 bits. One well in the same general area used 89 bits to reach the same depth. Fig. 1A



CARTER experienced little difficulty in drilling the 1 Williams. Compare the Williams' drilling curve with that of Well "B". Fig. 1B

ON bottom 201 hours and 15 minutes with one bit is a real accomplishment. This was recorded recently on an air-drilling operation for Carter Oil Co. in Atoka County, Oklahoma. The bit made 1,327 ft. before it was finally pulled, and it was in good condition at the end of the run. The bit is shown at left in the accompanying photo.

Over-all performance on this air-drilled hole was highly satisfactory, 15 bits compared to one well in the area that had used 89 bits to the same depth of 5,093 ft., 39 days compared to 72 days on the total drilling time.

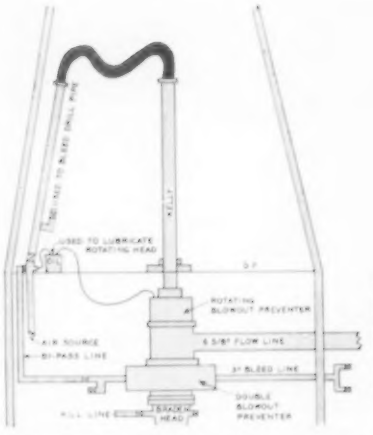
Savings on rig time and drilling mud, and lack of trouble while drilling were the biggest factors in making the air drilling a success.

In Atoka County, the Atoka shale gives considerable trouble during normal drilling operations. The shale caves badly, causing stuck drill pipe and fishing jobs; or as often happens, the hole will slough while making a trip and the contractor on occasion had to redrill as much as 3,000 ft. of shale while drilling with conventional mud. Because of these hazards, drilling operations in the area are on a day-work basis on wildcat wells. All these factors convinced Carter engineers that air drilling might be the best way to drill a proposed wildcat, the 1 Williams (NW SW NE 4-3s-10e). Although Carter had had a little experience with air drilling, the decision was made to use air, and the contract for the well was awarded to Vierson & Cochran, drilling contractors of Okmulgee.

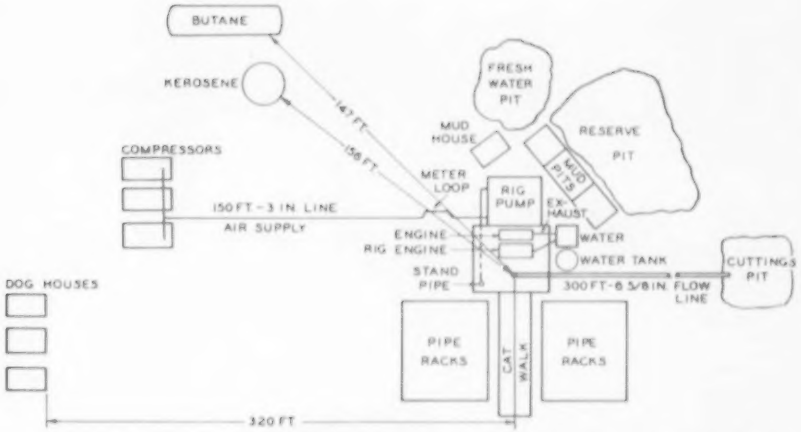
For the job, Vierson & Cochran used their No. 10 rig, powered with two-220 hp. gas engines. The contractor drilled surface hole with mud, setting pipe at 415 ft. Rigging up for air drilling required 5 days, but after drilling out from under surface pipe, there was only one delay. A fishing job at 3,585 ft. held up operations for almost 4 days.

Making hole . . . For drilling, two trailer-mounted air compressors were rented, each capable of delivering 750 cu. ft. of air. These were two-stage compressors with an intercooler between stages. Each compressor was powered by a set of twin diesels that delivered a total of 252 hp. They were rented from Well Completions, Inc., of Denver. At 4,719 ft., a third compressor was added. Air through the compressors was metered to check the volume. With two compressors, about 2 million cubic feet of air was used daily, and with three, about 2.7 million cubic feet daily.

Vierson & Cochran drilled a 9-in. hole with four to six drill collars above the bit. The weight on the bit averaged 4,000 lb. or less during drilling of 73



SCHEMATIC DIAGRAM shows how the air line and the mud line were connected. Fig. 2



PLAN VIEW of Carter's air-drilling operation (not to scale). Smoking was prohibited within 150 ft. of the rig floor. The three compressors delivered 2.7 million cubic feet of air daily. Fig. 3

per cent of the hole, although as much as 16,000 lb. was carried during part of the operation. The optimum rotating speed appeared to be 70 r.p.m. Over-all penetration rate was 6.9 ft. per rotating hour. The water courses on each bit were removed to handle the air volume, but otherwise were standard 9-in. bits, designed for drilling medium-hard formations.

Only 15 bits were used to reach total depth of 5,093 ft. Best performance was turned in by bit No. 13 that made 1,327 ft. in 201 hours and 15 minutes. Actually the bit was checked three times before it was finally pulled.

Surprisingly enough, the hole did not stay in gage. A caliper survey showed that the hole diameter varied from about 9 in. at total depth to as much as 25 in. in the upper portions and that considerable caving had occurred. Maximum hole deviation was 5°, and averaged less than 3°.

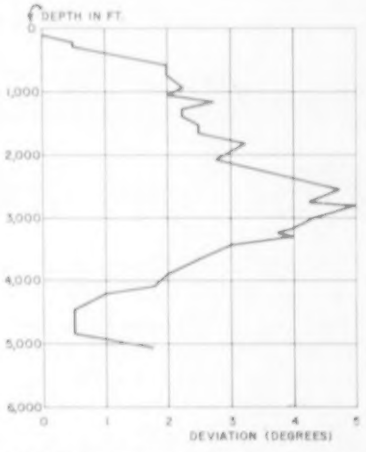
Safety precautions . . . With air drilling, the danger of blowouts increases because there is no mud in the hole to counteract formation pressures. For this reason, precautions were taken to minimize the danger of both blowouts and fires. The contractor installed a double-ram-type blowout preventer at the wellhead, equipped with remote controls. The usual rotating head was installed, common to air and gas drilling operations.

A pilot light was burning at all times at the end of the flow line that carried the dust away.

Rig lights were all safety-type, vapor-proof enclosure to eliminate the danger of fire if a bulb broke. Fuel tanks were placed 150 ft. from the well.

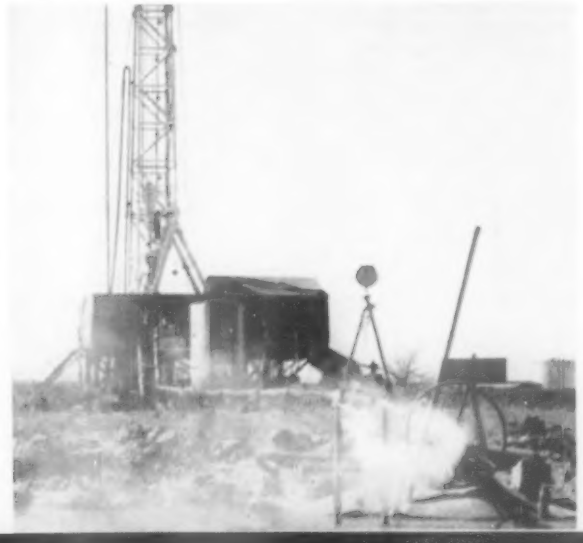
Sufficient mud was ready at all times to kill the well in case of a threatened blowout. The mud line was connected both through and under the blowout preventers to kill the well at a moment's notice. Every tour the crews closed and tested the blowout preventers, and the blind rams were shut each time the drill pipe was pulled.

No smoking was allowed within 150 ft. of the rig floor and no heaters were permitted on the rig. Fortunately the weather was mild enough that the heaters were not needed.

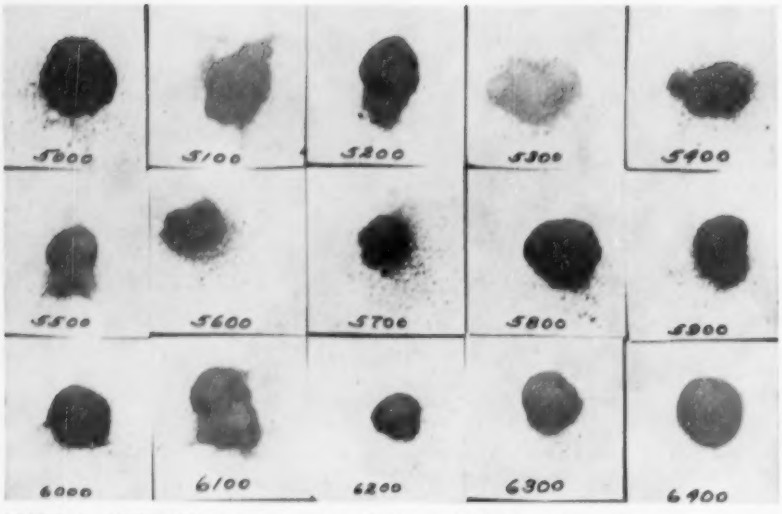


MAXIMUM DEVIATION was 5°. Weight on bit averaged about 4,000 pounds. Fig. 4

THE RING around the end of the dust exhaust line is a water sprinkler. This wets the dust and causes it to drop into the large cuttings pit.



EXHAUST GASES from the engines were discharged under water to eliminate the danger of sparks. The engines had sparkproof ignition systems.



TYPICAL CUTTINGS taken at various depths as indicated. Water was used as drilling fluid. Fig. 1.

New Oil Emulsion Speeds West Texas Drilling

Because it drills faster than anything else, water is used as the drilling fluid in most West Texas wells. However, a new oil-water emulsion has been making hole just as fast as water alone. Moreover, contractors report they get longer bit-bearing life with the emulsion. Longer bit life means longer runs at higher weights. These add up to faster drilling and lower costs. The operators are pleased with the emulsion too because the drill cuttings taken with it are larger than those taken with water. The story of this newly introduced emulsion is a good example of how cooperation between contractor and operator works to benefit both.

by Ed McGhee
District Editor

A NEW oil-water emulsifier is being used in West Texas and some other areas where water can be used as the drilling fluid. This emulsifier is important because it is the first that is stable against the usual oil-field contaminants. The main benefit of the emulsion is that it lengthens bit-bearing life. Thus, the contractor can put more weight on the bit and drill faster. Overall drilling time is cut too because there are fewer round trips to change bits.

Helps contractor, operator . . . Drilling contractors have always thought of clear water as the ideal drilling fluid. But geologists of the operating companies have been hard to sell on it. Oftentimes, cuttings recovered with water are too small for good analysis. As a result, the operators have often required the contractor to mud up the hole even though it meant a big cut in drilling speed. Time is money to the operator just as it is to the contractor, so both lost when the hole was mudded up.

While it has all the good qualities of water, the new emulsion gets around the objections to water. Figs. 1, 2, and 3 show some typical cuttings taken with water and some taken with the emulsion.

Aside from its direct value in the hole, the drilling fluid is important for another reason. It shows how, in a time of rapidly rising costs, both the contractor and operator can save money through cooperation. The nonionic emulsifier that is the heart of the clear water emulsion was introduced by Great Western Drilling Co. of Midland.

Several operators cooperated with this contract driller on trial runs of the new chemical. Working together thus produced the experience that proved the merit of the emulsifier. The end result is faster drilling for many other contractors (which saves money too for the operators they drill for) and the good drilled cuttings the operators want. This is not the only instance where operators who gave the contractor enough rein on the drilling fluid found it helped not only the contractor but also themselves.

No contamination trouble . . . Great Western's new emulsifier is not the first tried for clear-water and oil-drilling fluid. However, the older chemicals were of a different chemical nature, being either cationic or anionic instead of nonionic like the new compound. General experience with most of the older chemicals was that they were unstable against contamination.

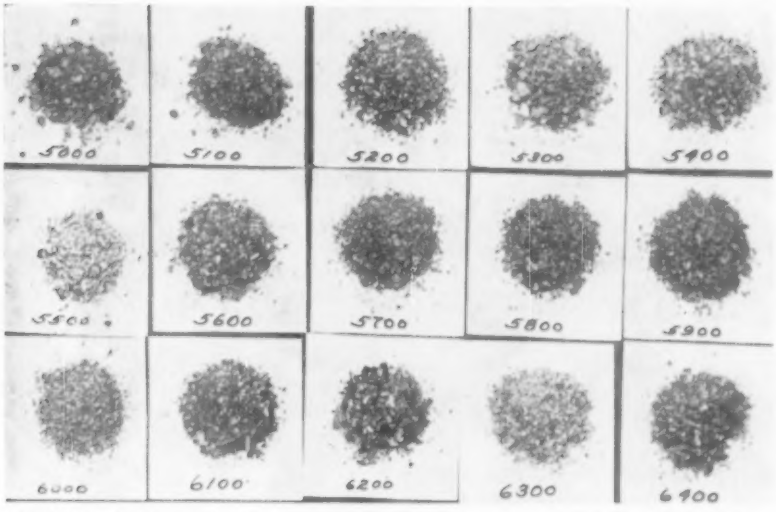
The clear-water emulsion is stable against contamination and even permits use of salt water instead of fresh water as the continuous phase of the mud. The emulsifier is added at about 2 gal. per bbl. of oil, and oil (usually diesel fuel) runs about 5 per cent of the mud volume.

Often the emulsion carries a small amount of CMC or starch to give some film-forming character resulting in reduced fluid loss. And, more important, solids are kept down to the absolute minimum.

No one is certain exactly why the drilled cuttings are larger with the emulsion than with plain water. However, surface-active agents alone have not given the consistent good results the emulsion does. See Table 4.

While the rotary viscometer viscosity of the emulsion is the same as (or 1 cp. more than) water, the funnel viscosity is usually slightly less. Therefore, it is uncertain that a greater turbulence in flow of the emulsion up the annulus exists that could account for the cuttings reaching the surface faster and prevent them from being ground finer. Some mud men think that the emulsion may give each chip an oil film that buoys it, thus getting it to the surface quicker and in better shape. But oil contamination of the cuttings has been no problem.

To get the good cuttings requires about 5 per cent of oil. On two different wells where the emulsion was in



SAMPLES RECOVERED with low-surface-tension oil in water emulsion as drilling fluid, at the indicated depths. Fig. 2.

use, the cuttings were too small. In both cases, oil content had dropped to about 2 per cent.

Keep pits clean . . . In spite of the emulsion's ability to bring good cuttings out of the well, these cuttings fall out quickly at the surface if the pits are clean and there is sufficient settling time.

Many drilling men report that penetration rate slows noticeably when plain water becomes only slightly cloudy. For that reason, it's important to keep the pits clean and give the return water time to settle before going through the pumps again. The same applies to the clear-water emulsion. Its effectiveness is cut by allowing the drilled solids to build up in the pits and shorten settling time of the fluid.

How it acts in the hole . . . Clear-water emulsion is not only a good drilling fluid but also a good corrosion inhibitor. In fact, it even protects the drill string when salty and aerated with large volumes of air. This protective quality has shown up in field as well as laboratory tests.

Like other emulsion drilling fluids, clear-water emulsion cuts down the torque on the drill string during rotation. Moreover, the worn-out bits come out of the hole bright and shiny, with no signs of balling.

Where lost circulation is a problem in highly faulted or other thief zones, cost to maintain the emulsion can become too high, then the contractor has to revert to water alone. However, some say that the emulsion is not so apt to be lost to thief zones as is clear water, even when filter loss is the same.

No one has explained exactly why this should be so. When there is a fluid loss, one method of fighting it is to slug into the hole a batch of bentonite, leather fiber, or other similar lost-circulation material. For salt-water systems, the materials would include salt-water clay.

Because the emulsifier works well in the presence of calcium, it's possible to carry extra calcium when drilling bentonitic shales to prevent any increase in viscosity. Actually, the emulsion is said to perform better in the presence of calcium than in extremely fresh water. As a result, calcium (in the form of lime) is often added.

Thus far, there has been no well with bottom-hole temperature above 200° F. where the emulsion was used. And there have been no temperature troubles to date.

On the surface . . . Great Western admits that their new emulsifier will not form as tight an emulsion as some other compounds they have used. It does, they say, form as stable an emulsion as needed for oil-field use; and, besides, it has the corrosion inhibition property that other emulsifiers don't. A too tight emulsion could even interfere with the film-forming qualities of the fluid.

In the field, clear-water emulsion looks better after it has been used for 8 to 10 hours. After it has made several circulations, it is thoroughly mixed and emulsified and has a whitish color. On one well where fishing slowed operations, the emulsion remixed easily and without trouble after 5 days of disuse.

Foaming is not a problem with the new emulsifier. It is no worse in salt water than conventional salt-water mud with oil, and the usual antifoaming compounds are effective.

When the hole finally has to be mudded up, the emulsion is a great help in keeping zero-zero gel strength. Its ability to stabilize bentonite and salt-water clays against calcium and other contaminants makes it useful in drilling mud that requires some viscosity. In such cases, the emulsifier has not caused a serious loss of yield from the clays. Possibly their fine particle size is the reason.

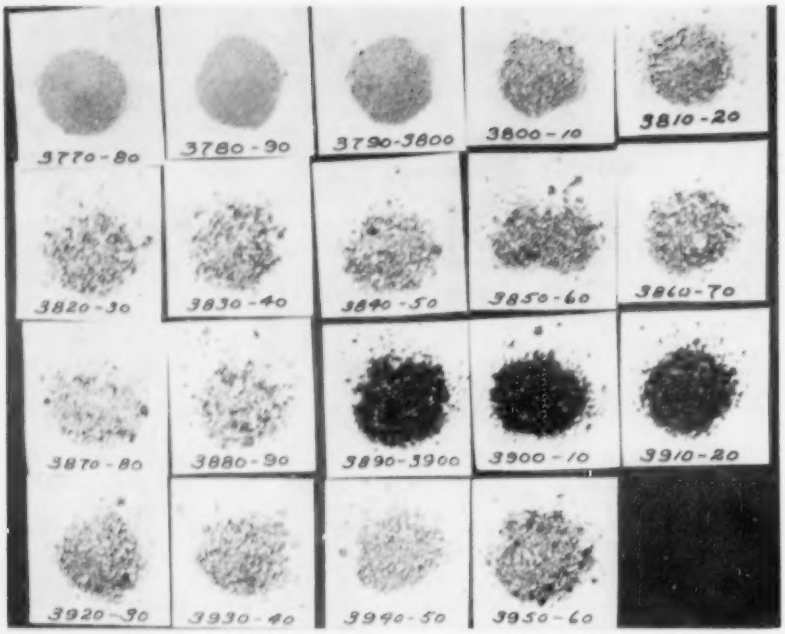
Adding the oil . . . Most of the drilling done with the new emulsion has been done with diesel oil as an ingredient. However, crude oil has been used successfully on several wells, both with salt and fresh water. There is some danger in handling crude and a good quality (usually 40° or higher gravity) is not always available. For those reasons, diesel will likely continue to be used most.

Recommended practice is to mix the oil and emulsifier together before putting them into the system. The emulsifier mixes easily into the diesel fuel, and thus cutting it insures its even distribution throughout the mud system. The mixture should be stirred during addition to prevent any settling.

In fresh-water emulsions, the oil content usually runs 5 per cent of the mud volume and the emulsifier is added at 2 gal. per bbl. of oil. This ratio is sometimes cut to 1 gal. per bbl. of oil for daily maintenance, but care must be used to do this.

Salt-water emulsions commonly carry as much as 10 per cent oil and 4 gal. of emulsifier per barrel of oil. This higher concentration protects better against corrosion and is easier to control.

"Great Western admits that their new emulsifier will not form as tight an emulsion as some other compounds they have used. It does, they say, form as stable an emulsion as needed for oil-field use; and, besides, it has the corrosion inhibition property that other emulsifiers don't. A too tight emulsion could even interfere with the film-forming qualities of the fluid. In the field, clear-water emulsion looks better after it has been used for 8 to 10 hours."



TYPICAL CUTTINGS taken at various depths as indicated. Emulsion was added at 3,780 ft. Fig. 3.

TABLE 1—COMPARISON OF WELLS DRILLED WITH CLEAR-WATER EMULSION AND WELLS DRILLED WITH WATER AND MUD, PARKER FIELD, ANDREWS COUNTY, TEXAS

Well	Interval	Trip and rotating hours	Bits used	Bit weight	Drilling fluid
C-1	4,600-8,500 (3,900 ft.)	709	48	30-40,000	Water to 8,000; mud to 8,500
C-2	4,600-8,500 (3,900 ft.)	556	44	40-45,000	Water to 8,100; mud to 8,500
C-3	4,600-8,500 (3,900 ft.)	572	43	35-45,000	Water to 8,200; mud to 8,500
C-4	4,600-8,500 (3,900 ft.)	536	39	35-45,000	Water to 8,300; mud to 8,500
C-5	4,900-8,500 (3,600 ft.)	379	23	35-65,000	Water and oil to 8,500
C-6	4,900-8,500 (3,600 ft.)	367	21	35-65,000	Water and oil to 8,500

TABLE 2—COMPARISON OF WELL DRILLED WITH CLEAR-WATER EMULSION AND WELL DRILLED WITH WATER AND MUD, EAST SEMINOLE AREA, GAINES COUNTY, TEXAS

Well	Interval	Trip and rotating hours	Bits used	Bit weight	Drilling fluid
W-1	4,750-10,300 (5,550 ft.)	904	71	50-55,000	Water to 5,800; mud to 10,300
F-1	4,750-10,300 (5,550 ft.)	606	*39	35-70,000	Water and oil to 10,300

*Includes some chert bits.

Field experience shows that small amounts of Driscose—below that needed for filter-loss control—prevent a rapid drop in oil concentration. As little as 0.1 lb. per bbl. of high-viscosity Driscose will do the trick. On an average well, daily treatment would run 5 bbl. of oil, 5 gal. of emulsifier, and 15 lb. of the CMC for a 1,000-bbl. mud system. Apparently, the Driscose also helps the emulsion stability without hurting its film-forming ability.

In a like manner, starch is an economical help in keeping up oil concentration in salt-water emulsions. Moreover, a small amount of salt-water clay with the starch also seems to help. A typical saturated salt mud is treated with 5 lb. of salt-water clay per barrel to give a 35 or 36-second viscosity. Then, the oil and emulsifier are added; finally enough starch is put in to raise viscosity to 45 seconds. Great Western reports that the starch yields quicker in this way.

Does it pay? . . . There are field cases to back up the arguments for the new emulsion. For a comparison of wells drilled with water and mud and wells drilled with the water-and-oil emulsion, look at Table 1. All these wells are in Parker field of Andrews County, Texas. Notice for those wells drilled with the emulsion instead of water and mud, there is a savings in both bits used and in trip and rotating hours.

Cost of the emulsifier and oil on the last two of these wells was $0.40 to $0.45 per foot.

The faster drilling was due, of course, to higher bit weights; the oil emulsion permitted longer runs per bit even with this high weight because of better bit-bearing lubrication.

Table 2 shows similar results with the emulsion in the East Seminole area of Gaines County. The footage cost was cut about one-third using the emulsion.

Table 3 compares the amount of mud materials on these same two wells. The first well used mud at a cost 10 per cent higher than the second which used the emulsion.

Table 4 shows how the emulsion compares with surface-active agents (surfactants) alone. The cost per foot with surfactants was about 20 per cent higher than with the emulsion. Both wells are in the Dora Roberts pool of Ector County.

These wells show that the emulsion is an inexpensive way to step up weight on bit and drill faster.

As more wells are drilled with the emulsion, the information from them will be compiled into a report to be presented by H. E. Mallory of Great Western Drilling Co. This report will be given before the A.A.O.D.C. in its annual meeting to be held in Fort Worth, October 7-9. At present, the emulsifier is available through Magcobar as "Drilling Milk"; through Baroid as "Trimulso"; and through Macco Corp. on the West Coast as "Lumul."

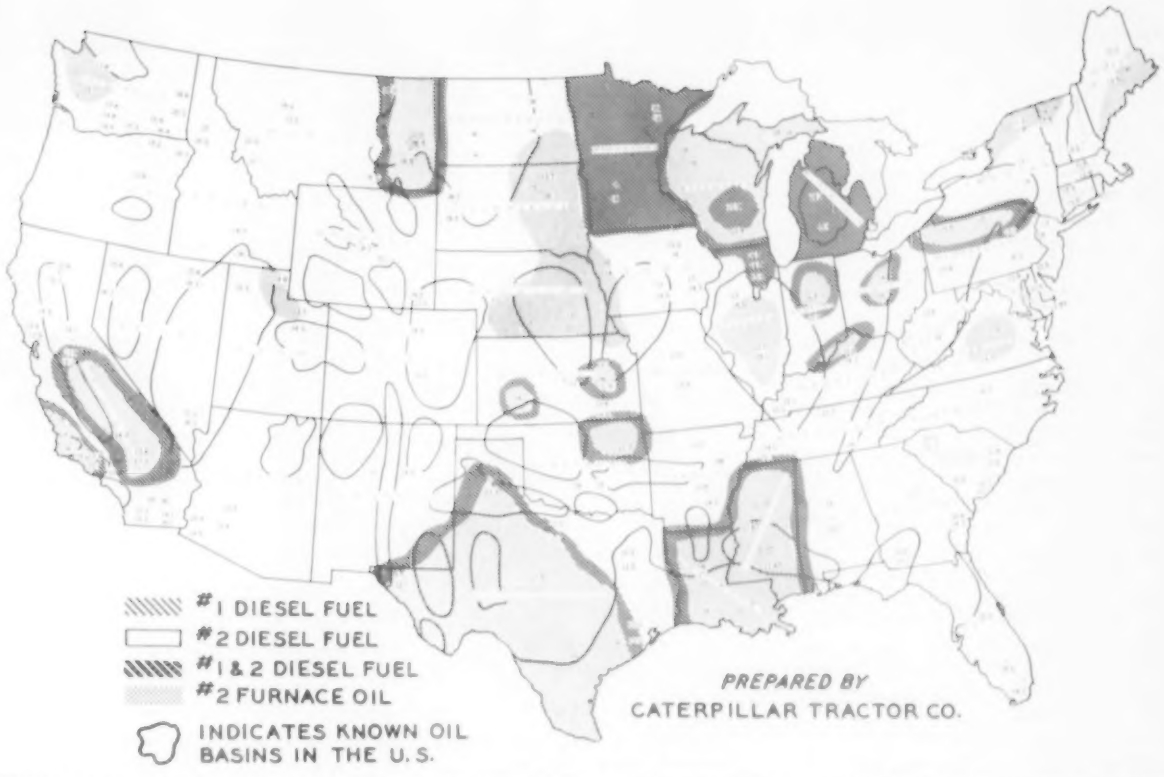
TABLE 3
Comparison of Mud Materials Used on Well Drilled With Clear Water and Well Drilled With Water and Mud*

Material—	Well W-1 (drilled with water to 5,800; mud to 10,300)	Well F-1 (drilled with oil and water emulsion to 10,300)
Gel, sacks	956	100
Driscose, sacks	4	32
Fibrous material, sacks	89	0
Leather material, sacks	40	0
Flake material, sacks	40	0
Caustic soda, lb.	4,300	550
Quebracho, lb.	3,700	275
Soda ash, lb.	8,500	0
Carbonox, lb.	2,000	0
Diesel oil, gal.	0	11,520
Emulsifier, gal.	0	350
Unit cost, per cent	100	90

*This comparison is for the same two wells shown in Table 2.

TABLE 4—COMPARISON OF WELL DRILLED WITH CLEAR-WATER EMULSION AND WELL DRILLED WITH SURFACTANT ALONE, DORA ROBERTS POOL, ECTOR COUNTY, TEXAS

	Interval	Trip and rotating hours	Bits used	Drilling fluid
Well A	5,200-10,000 (4,800 ft.)	446	26	Water and oil emulsion
Well B	5,100-10,000 (4,900 ft.)	512	40	Water with surfactant



DIESEL FUEL AVAILABILITY AND PRICES in the United States. Prices vary in some areas, but these are representative averages. Prices are in cents per gallon.

Are Diesel Fuels Better Than Necessary?

by G. L. Farrar
Engineering Editor

DIESEL fuels now being marketed throughout the United States are better than they need be in these respects:

- **Cetane number** is substantially higher than is required by the great majority of diesel engines.
- **Distillation end point** is lower than necessary for good operation.
- **Other specifications,** such as gravity, viscosity, pour point, carbon residue, and corrosion, are higher than is necessary.

The cost differential between gasoline and diesel fuel is becoming quite narrow. This because of the increased use of diesel fuel and the upgrading of high-speed-diesel fuel beyond practical limits. (Anything over 1,000 r.p.m. is considered high speed.)

Fuel ratings . . . A resume of A.S.T.M. ratings (based upon manufacturers' fuel specifications) is shown in Table 1. The two left-hand columns prepared by A.S.T.M. contain a list of factors which are intended to serve as guideposts for typing or classifying No. 1 or No. 2 diesel fuels. The remaining columns are typical diesel fuels now marketed.

The importance of this table is found in the relationship which exists between the A.S.T.M. fuel specifications (Columns 1 and 2) and the fuels currently available (Columns 5 and 6). The cetane rating of the current fuels has been upgraded sharply. For instance, the cetane number for No. 1 diesel fuel is approximately 50 per cent and for No. 2 diesel fuel, about 25 per cent higher than corresponding A.S.T.M. recommendations.

TABLE 1—COMPARISON OF A.S.T.M. DIESEL-FUEL SPECIFICATIONS TO TYPICAL DIESEL FUELS CURRENTLY MARKETED

	A.S.T.M.-D975-53T diesel fuel spec.		Kerosine (often used as No. 1 diesel fuel)	Typical fuel specifications*			
	No. 1	No. 2		No. 2 fuel oil	No. 1 diesel	No. 2 diesel	Marine diesel
Cetane number, min.	40	40	60	35-45	55-60	48-50	35-40
Sulfur content, max. (%)	0.50	1.0	0.15	0.2-0.7	0.01-0.5	0.01-0.75	1.0
Gravity, A.P.I. at 60° F.			43-36	34	36-40	34-39	32
S.U.S. viscosity at 100° F.		32-45	33	34	34-38	35	30-40
Flash point, °F.	100	125	115-135	150	140-170	150	150
Pour point, °F.	(1)	(1)	Varies	—5	0-10	0-10	0
Water and sediment, per cent max.	Trace	0.10	0.10		0.05	0.10	0.10
Carbon residue, 10 per cent bot. max.	0.15	0.35		0.10	0.05	Trace	0.35
Ash, per cent	0.01	0.02	Nil	0.02	0.02	0.10	0.02
Copper strip-corrosion	No. 3	No. 3		Neg.	Neg.	Pass	Pass

*These averages were compiled from information received from three of the major oil companies. †For cold-weather operation the pour point would be specified 10° F. below the ambient temperature at which the engine is to be operated except where fuel-oil heating facilities are provided.

This presents a peculiar situation where the current No. 2 diesel fuel exceeds specifications for A.S.T.M. rated No. 1 diesel fuel. Economically or performancewise this practice is not necessary for meeting the requirements of most diesel engines. This statement is borne out by these discussions of the important fuel tests:

1. Cetane: Usually for colder climes a comparatively high cetane rating is desirable. Cetane only helps starting—it does not provide more horsepower. According to Engr. Bull. AD-206, Standard Oil Co., page 36, "The cetane requirements of engines vary and any excess over that required for satisfactory combustion is of questionable value."

2. Sulfur: A limit of 1 per cent maximum is usually set. However, since the advent of high-detergent oils of the Series 2 or 3 type, sulfur content is not as critical as formerly.

3. Gravity: Lower A.P.I. (American Petroleum Institute) ratings indicate heavier fuels, which contain more heat value. Good quality fuels of this type have higher thermal efficiencies and lower consumption, although there is no direct correlation with ignition quality or satisfactory performance.

4. Viscosity: A viscosity which is too high makes for poor fuel atomization thereby decreasing combustion efficiency. High-speed and medium-speed diesel fuels are usually in a range of 33-45 Saybolt seconds at 100° F. or 2.1-5.8 centistokes.

5. Distillation: "Automotive fuels should not be lighter than necessary to assure clean burning, since light fuels are lower in B.t.u. content,"—from Standard Oil Co. Engr. Bull. AD-206, page 38.

6. Flash point: The Interstate Commerce Commission and most states have their own restrictions.

7. Pour point: Usually the pour point should be 10 points lower than the operating temperature.

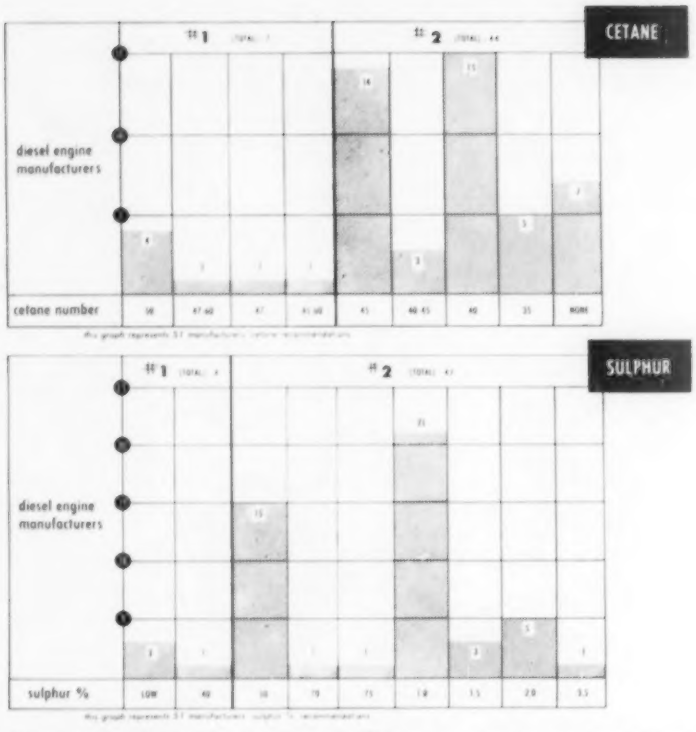
8. B.s. and w. or water and sediment: No more than a trace should be present. The refineries put out a product which is clean; most of the water and sediment which enters thereafter is caused by improper handling.

Diesel fuel, though just as clean as other fuels, being heavier and more viscous does not allow solids to settle out as rapidly as gasoline. Fuels should be stored in large containers, larger than 50-gal. drums, and allowed to settle for 24 hours before use.

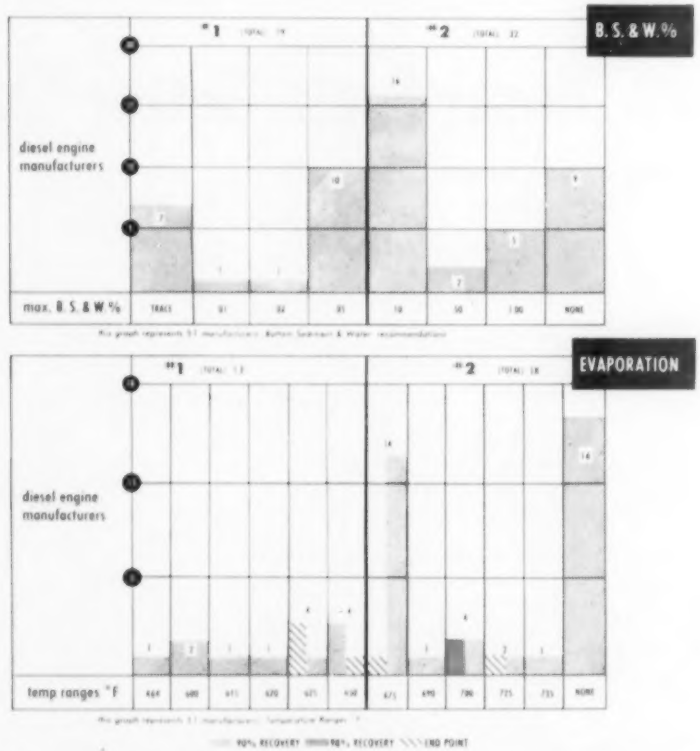
9. Carbon residue: This is a measure of how completely a diesel fuel will burn.

10. Ash: Practically all of this is abrasive. Fuels should not have a rating of more than 0.02 per cent ash content.

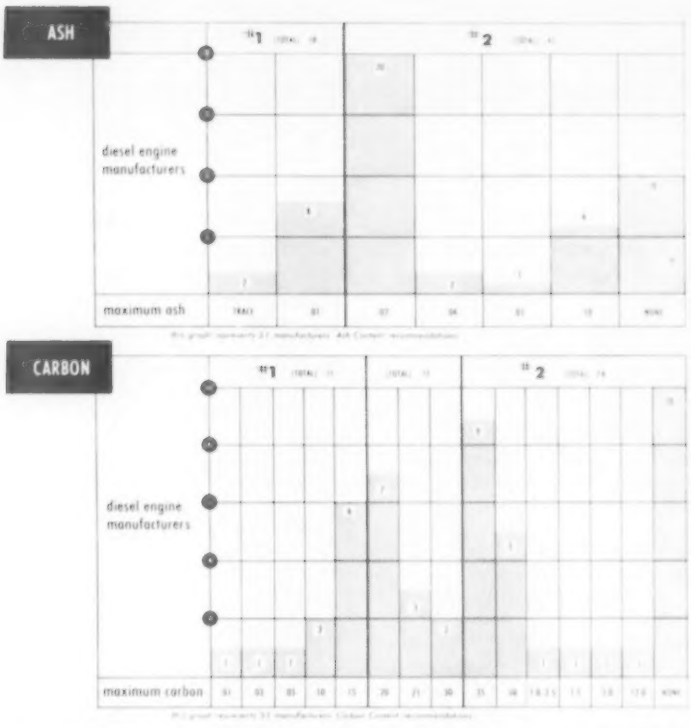
11. Corrosion: Anything more than



CETANE NUMBER AND SULFUR specifications as given by the manufacturers of diesel engines. Fig. 1.



B.S. AND W. AND EVAPORATION specifications as given by the manufacturers of diesel engines. Fig. 2.



ASH CONTENT AND CARBON specifications as given by the manufacturers of diesel engines. Fig. 3.

slight discoloration should be rejected. This test is designed to protect fuel-injection equipment which is the most-expensive component of a diesel engine.

Fuel Specifications

Figs. 1-3 represent a compilation of 51 diesel-manufacturers' fuel specifications. Practically all the manufacturers producing diesel engines for commercial purposes are represented.

. . . Cetane needs. Forty-four of the 51 manufacturers can use a diesel fuel with a cetane rating of 45 or lower. Only seven require a higher cetane fuel (Fig. 1). This shows that current fuels are considerably higher than need be to meet the requirements of the majority.

Another fuel factor which is important to the user is the distillation or evaporation specification (Fig. 2). This determines the heat content in the fuel. A gallon of No. 2 diesel fuel will contain from 2,500 to 5,000 more B.t.u.'s than a gallon of No. 1 diesel fuel.

This figure shows that 38 of the 51 manufacturers can use a fuel evaporated at 675° F. or more. Only 13 need a fuel distilled off at temperatures lower than 675° F.

The following example illustrates the advantage of using a fuel with a lower cetane number and higher distillation range. The relationship applies to any diesel engine.

Using a 210-hp., 1,800-r.p.m. engine:

0.5 lb. fuel × 210 = 105.0 lb. fuel per hour

Using No. 1 diesel fuel:

105/6.95 = 15.25 gal. per hour

Operating 8 hours per day = 8 × 15.25 = 122 gal. per hour.

No. 1 diesel fuel cost per gal. — 16 × 122 = $19.52 per 8 hours.

Using No. 2 furnace oil:

0.5 lb. fuel × 210 = 105.0 lb. fuel per hour

105/7.11 = 14.76 gal. per hour

Operating 8 hours per day = 8 × 14.76 = 118.08 gal. per 8 hours.

No. 2 furnace oil — cost per gal. 14 × 118.08 = $16.53 per 8 hours.

Savings per 8 hours:

$19.52 No. 1 diesel
16.53 No. 2 furnace oil

$ 2.99 saving per 8 hours

Operating 2,400 hours per year, the saving would be:

2,400 ÷ 8 × 2.99 = $897.00

It is definitely advantageous to the consumer to order as heavy a fuel as his diesel engine and temperature conditions permit. Fuel costs can present approximately 80 per cent of total operating costs for a diesel-engine industrial installation; for dieselized tractors, etc., this percentage will be less because other factors are included in operating costs. This factor adds no little incentive as a method of reducing costs.

Other limits . . . The remaining graphs (Figs. 1-3) depict several other fuel limits as specified by the same 51 manufacturers. These factors influence the degree of maintenance which may be expected if the restrictions are not heeded.

What to Do About It

The fact has been established that heavier and reduced cetane fuels are advantageous. The question is, how does the customer acquire them? The responsibility rests upon the supplier, the refiner, and the user.

The supplier should handle more than one grade of fuel (see map). He is capable of doing this because adequate space is usually available. His responsibility lies in serving the market to the best of his ability.

If the refiner incorporated less of the more volatile fuels in current diesel fuels, this portion could be used for additional gasoline.

The argument for high-cetane fuels during winter months is valid to a degree, but only for the northern climates. A large area of the United States would require no change for winter or summer.

The responsibility of the user lies in insisting upon fuels as heavy as possible, as long as the manufacturer's specified fuel rating is not exceeded.

OPERATING COSTS COMPARISON OF DISTILLATE FUEL
(Consumption, 0.5 lb. fuel/hp./hr.)

Grade—	Lb. per gal.	Hp.-hr. per gal.	Typical price, $ per gal.	Per 100 hp Gal. per hr.	Per 100 hp Cost per hr.
Kerosine	6.91	13.82	0.18	7.24	$1.30
No. 1 diesel fuel	6.95	13.90	0.16	7.19	1.15
No. 2 diesel fuel	6.99	13.98	0.15	7.15	1.07
No. 2 furnace oil	7.11	14.25	0.14	7.03	0.98

Acknowledgments

Information for this article was obtained from: (1) Surveys made by the Caterpillar Tractor Co., Peoria, Ill.; (2) "Automotive Diesel Engines," Engr. Bull. of Standard Oil Co. (Ind.), Chicago; and (3) "The Fundamentals of Diesel Lubrication," by Shell Oil Co., New York.

ELEMENTS OF FIELD PROCESSING—18

Back-Pressure and Pressure-Reduction Control—1

by Dr. John M. Campbell

THE regulation of back pressure and pressure reduction in a system may be conveniently divided into three categories when considering the type system needed. The low-pressure range is usually 0-125 psig., the intermediate-pressure 125-500 psig., and the high-pressure greater than 500 psig. The use of these ranges is primarily for convenience since some types of valves can operate satisfactorily in all of them.

All pressure regulators are similar in principle, the specification of type being dependent on the process requirements, pressure drop, variation in flow rate, limitations of the loading device, and the maximum pressure. In either of these services pressure is regulated by the control of flow rate.

This flow is controlled through movement of the regulator inner valve which is held either open or closed by some means of preloading. The amount of preloading and the size of the diaphragm used, if any, are such that the inner valve will move to the opposite extreme of travel shortly after the diaphragm pressure passes the desired working pressure. The control pressure is therefore varied by changing the amount of preload, thus upsetting the equilibrium between it and the diaphragm pressure. With most valves increasing preload increases pressure.

Author is with the school of petroleum engineering, University of Okla., Norman.

The preloading may be accomplished through the use of spring compression, dead weight or fluid pressure. Valves A and B, shown in Fig. 1, are examples of back-pressure valves using the first two forms of preloading. Valve C is a spring-loaded valve incorporating a built-in pilot. All three valves shown are suitable in the low-pressure range.

Back-pressure service . . . In back-pressure service the preloading normally closes the valve, while in pressure reduction the valve is normally open. With the former the upstream pressure is introduced under the diaphragm and works against the loading device to position the valve properly.

In pressure-reduction service, the downstream pressure is introduced under the diaphragm and tends to close the valve until the inner valve is properly positioned. Many valves may be changed from one service to the other by simply reversing the valve body and the stem, while still others have provision for reversing the diaphragm action.

FIELD PROCESSING

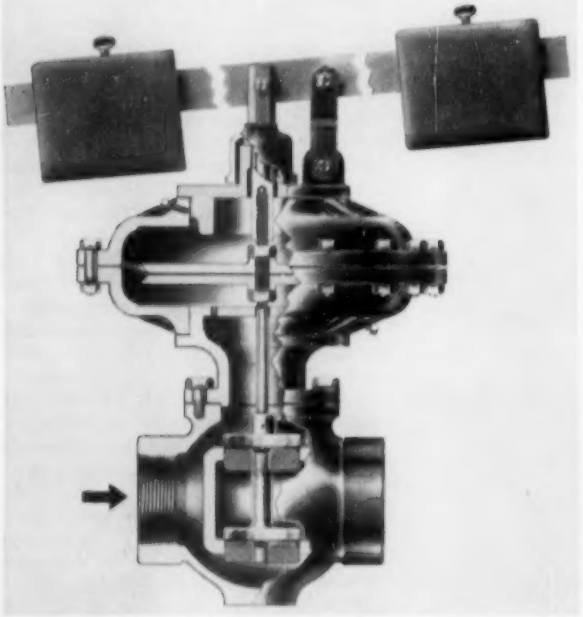
Some applications require that a certain differential pressure be maintained across the valve regardless of how much the upstream or downstream pressures vary. The chief application of this is with positive-displacement pumps where the maximum pressure ratio is controlled by a valve located on a bypass.

In this service the valve is normally closed with the downstream (higher) pressure under the diaphragm and the upstream (lower) pressure on top of the diaphragm. The desired differential is then established with the loading device.

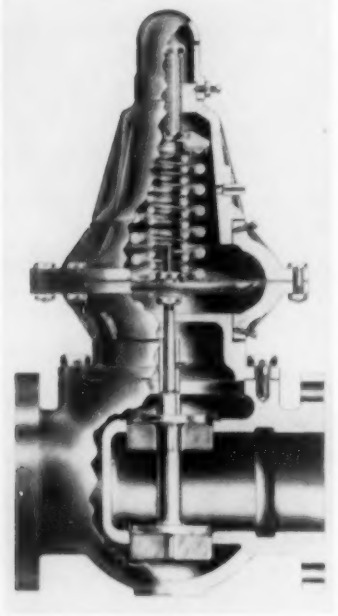
Each of the types of preloading has its distinct applications and limitations. The weight-loaded regulator is very sensitive within its pressure range if the flow rate does not vary widely. This is primarily true because the inner valve may move through a greater change of position than with a spring-loaded valve. The greater sensitivity is particularly pronounced when the diaphragm is in direct communication with the valve body, which eliminates friction in the stuffing box.

Very few weight-loaded regulators are recommended above 50 psig. because at greater pressures heavy weights are necessary. As a result a small change in controlled pressure is only a small portion of the loading weight and there is less subsequent movement of the inner valve, which in turn renders control more difficult.

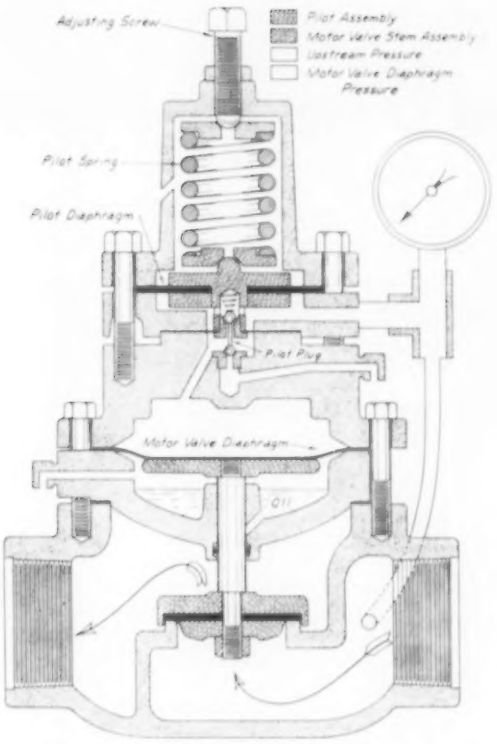
Sensitivity . . . A spring-loaded regulator is generally slightly less sensitive than a comparable weight-loaded regulator under constant-flow conditions. In low-pressure service (particularly between 0 - 20 psig.) it is an ideal type of loading for the springs used tend to compress in direct proportion to the load, with constant load increase being required for each increment of



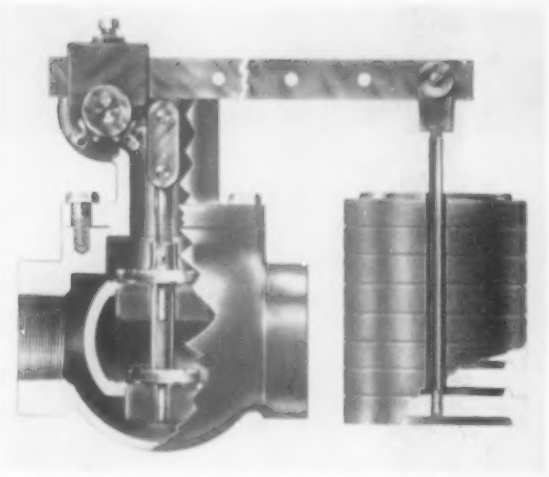
DEAD-WEIGHT PRELOADED DIAPHRAGM back-pressure valve. Valve A. Fig. 1A.



SPRING-COMPRESSION valve. Valve B. Fig. 1B.



SPRING-LOADED VALVE, incorporating built-in pilot. Valve C, Fig. 1C.



SIMPLE, WEIGHT-LOADED back-pressure valve. Fig. 2.

TYPICAL LOW-PRESSURE-VALVE COSTS (2-in.)

Valve A, Fig. 1	$140
Valve B, Fig. 1	85
Valve C, Fig. 1	90
Fig. 2	50

compression. Consequently, spring loading is excellent in low-pressure systems and where the diaphragm is loaded with a pilot. As each compression increment is a valve-travel increment, the valve travel is always in proportion to the relationship of the controlled pressure to the preloading.

At high pressure this characteristic does not exist because of the heavy springs required. Therefore nonpilot-operated spring-loaded regulators are not normally recommended above 125 psig. because of this loss in sensitivity and their closer approach to the price of pilot-loaded regulators.

With either a direct-acting weight or spring-loaded regulator a change in the uncontrolled pressure will cause a corresponding change in the controlled pressure if the pressure drop is low. This is true especially if the pressure drop is less than 25 per cent of the inlet pressure. Therefore when accurate control is necessary under these circumstances, pressure-loaded or pilot-operated valves are recommended.

Throttling and shutoff . . . Both the regulation of flow and tight shutoff should not normally be attempted with the same valve unless absolutely necessary. If this is required by operating conditions, a single-seated valve should be used. Double-ported valves are seldom operated under the actual conditions at which they were manufactured and tested. Consequently, as temperature changes the distance between the two seats, only one of the two will seal off tight.

Single-ported valves will seal off tight but the unbalancing force on the inner valve increases with the square of diameter. Inasmuch as the diaphragm-spring combination must overcome this force and still control travel, it is logical that the inner-valve size is limited by practical diaphragm size. As a general rule of thumb, direct-acting spring and weight-loaded regulators up to 2-in. diameter may be used with single-port construction.

Pilot-loaded valves, either pressure-balanced or spring-loaded, offer particular advantage at higher pressure since the pilot presents a means of increasing the control-valve travel with a given change in controlled pressure. This enables one to use a more accurately sized valve. The resultant smaller valve gives better shutoff and closer control since the full range of valve travel my be utilized.

Low-Pressure Service

It is in the low-pressure range that weight and spring-loaded regulators find particular application on the lease. One of the most common applications is in back-pressure service on low-pressure separators operating at less than 40 psig.

All of the valves shown in Fig. 1 are applicable as is that shown in Fig. 2. The latter is similar to a diaphragm-type weight-loaded valve except that the weight simply acts to counteract the unbalanced force acting under the inner valve. The choice of this valve is predicated primarily from cost considerations since it is the cheapest of the valves, as the comparison below shows.

The simple weight-loaded valve shown in Fig. 2 has the advantage of being cheap and simple. Its primary disadvantage stems not from its operation but the circumstances surrounding its use. The weights become loose and shift, are lost, or are hindered in movement by outside obstructions. It is not too uncommon to see rocks and other miscellaneous objects used as substitutes for, or additions to, the proper weights. Consequently, these regulators serve as a proper but not necessarily satisfactory back-pressure control.

Not too many spring-loaded regulators are used on such separators because of their higher price, although they are generally satisfactory below 40 psig. The best regulator in this range is Valve C, Fig. 1. It gives fine control throughout the range with widely fluctuating flow rates and uncontrolled pressures. Where fine control is necessary, particularly above 40 psig., the extra investment is normally justifiable.

Because of the almost infinite number of different field conditions that arise, the above considerations can at best only serve as a general guide. Unfortunately the actual choice of type must often stem from experience.

Monolithic linings and wear plates:

Here's How Heat-Insulating Linings Are Maintained

by J. S. Clarke

Monolithic heat-insulating linings and steel-mesh-reinforced refractory wear plates have proved highly satisfactory in cat cracking use. Here are details on installation, inspection, and repair of these linings.

Maintenance of Catalytic Cracking Units—Part 3

LININGS are employed in large-diameter piping and vessels of fluid catalytic cracking units to protect the pressure shell against erosion by the catalyst and to insulate the pressure shell against high temperatures. Some linings may serve both purposes. For erosion protection, both metal wear plates and steel-mesh-reinforced refractory castable wear plates are used. The latter are most generally used.

Heat-insulating liners have been constructed of refractory tile, block insulation faced with tile or steel plate, castable insulation faced with steel plate, and in the more recent installations, of castable insulation faced with steel - mesh - supported castable refractory. The latter are referred to generally throughout the industry as monolithic linings.

Construction . . . Monolithic linings for vessels are constructed and installed as indicated by Fig. 1. For lines the construction is similar except that the castable insulation layer is 2½ rather than 3 in. thick as may be seen from Fig. 2. Occasionally the vessel or line vapors may be corrosive and will attack the shell or pipe wall on condensing in the lining. If this condition is anticipated, a ½-1 in. layer of cement may be applied against the shell before installing the insulating castable. Fig. 3 is a diagram showing this type of construction. Indicated also in this figure is the use of 10-gage wire mesh to help retention of the insulating castable while being installed.

The various steps in the installation of this type of lining are shown by Figs 4 and 5. Normally the refractory and insulating castables are applied by pneumatic gun but in certain cases such as this where space is limited, hand application may be necessary.

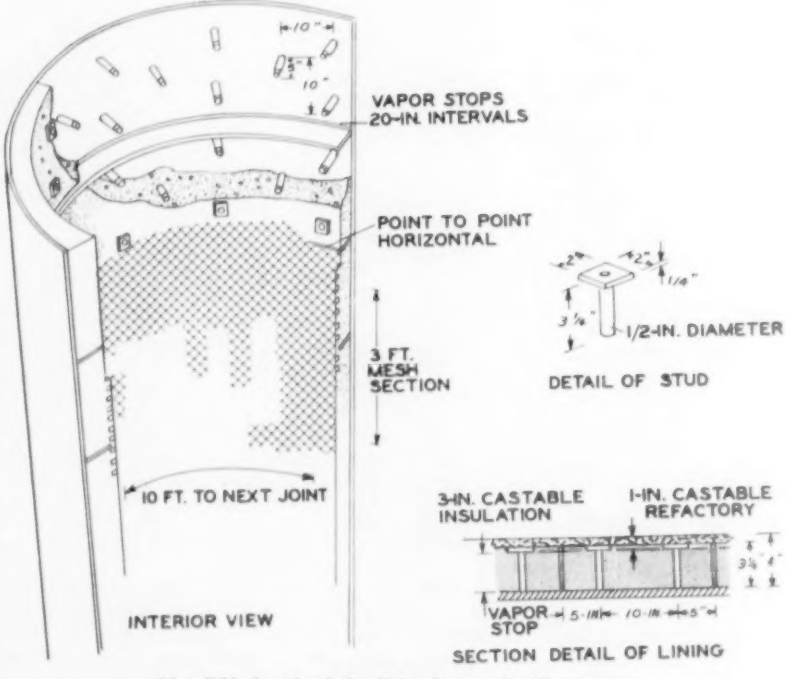
Several improvements in construction of monolithic linings have been made recently which have resulted in the virtual elimination of former difficulties with monolithic linings of the earlier type:

1. Originally the hexagonal steel mesh was installed in vessels with expansion gaps between adjacent panels. The panels were approximately 3 by 3 ft. This often resulted in panels coming loose entirely or curling at the edges, exposing the insulating layer to catalyst erosion. The present practice is to weld adjacent panels together to form a completely continuous construction.

2. The width of the vapor stops has been increased to extend from the shell to the underside of the steel mesh. This modification provides a positive stop against the channeling of vapors and also gives additional support for the steel mesh.

3. Separate studs and stud heads are now used. The stud head is attached to the stud **after** the insulating castable is installed. This prevents voids and trapping rebound under the stud heads which is apt to occur with integral studs and heads.

Important details . . . Certain details



Monolithic heat insulating lining for vessels. Fig. 1.

Author is with Esso Research & Engineering Co., Linden, N. J.

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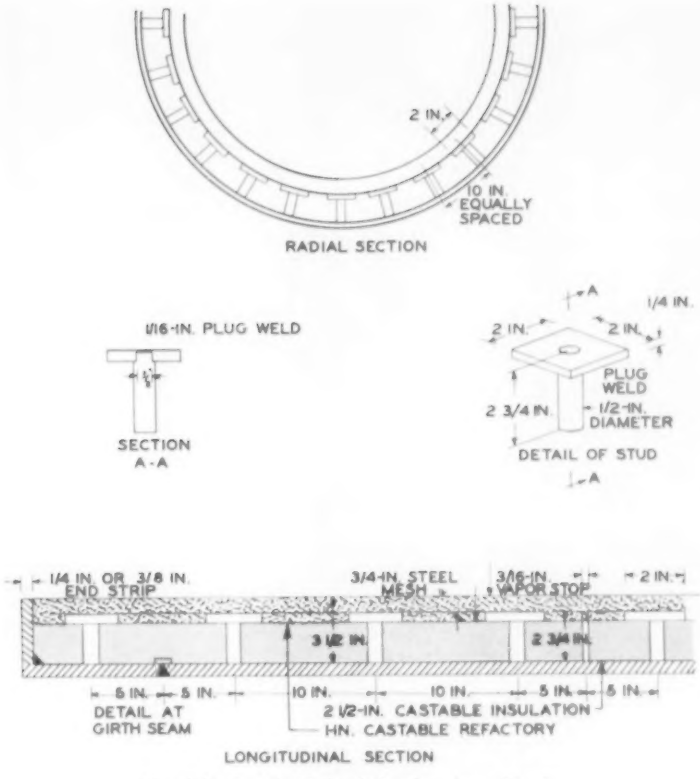
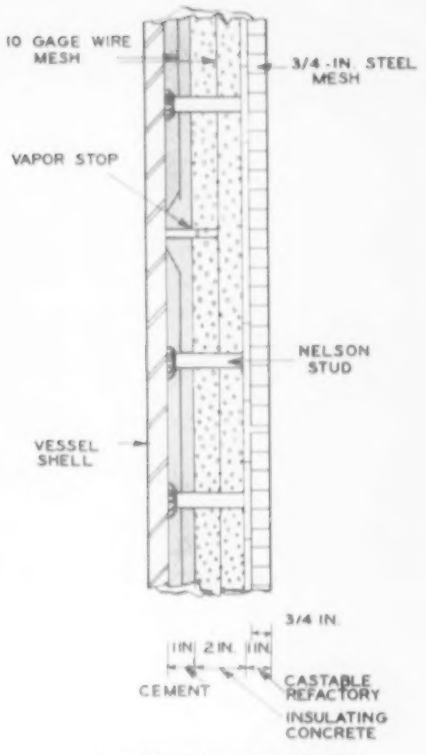


Monolithic heat insulating lining for pipes. Fig. 2.



Monolithic lining detail. Fig. 3.

in connection with the installation of monolithic linings and supported refractory wear plates which should be emphasized are outlined below:

1. The quality of the welds is of great importance when welding adjacent panels of steel mesh to each other and when welding the mesh to the shell or to the supporting studs. The minimum length of any such weld should be ½ to ¾ in. and preferably should extend the entire length of one side of an individual hexagon or 1 in.

2. The studs usually are resistance welded to the shell using a Nelson stud-welding gun. Each stud should be rapped sharply with a light hammer, after installation to test the stud-to-shell weld. Rewelding should be done by hand if necessary.

3. The layer of insulating castable should be given a careful check following installation for voids behind the stud heads (if integral studs are used) and near vapor stops. Any voids existing in these locations should be cleaned out and packed by hand. Incidentially, with respect to obtaining solidity of the insulating castable, it is impossible to gun it through the steel mesh and in no case should this be attempted as it will result in serious lack of fill behind the mesh.

4. The refractory castable outer layer should be troweled flush with the outside surface of the steel mesh since any overlay will result in spalling. Spalling from this cause is apt to cut deeply into the refractory layer and ultimately cause general failure of the lining.

5. Pneumatic application of the insulating and refractory castables gives the best results and should be employed to the maximum possible extent.

6. Experience indicates that with lines a finished inside diameter of about 30 in. is about the smallest practical size in which a liner may be installed. This, of course, would require hand application.

7. Any exposed edges of lining should be terminated with steel strips, and should be faired into the shell of the equipment to prevent channeling behind the lining and to reduce turbulence which will cause erosion.

8. All castables used in insulation linings and wear plates should be cured in accordance with the manufacturers' recommendations. This is important since without proper curing the material may develop only a small part of its potential strength.

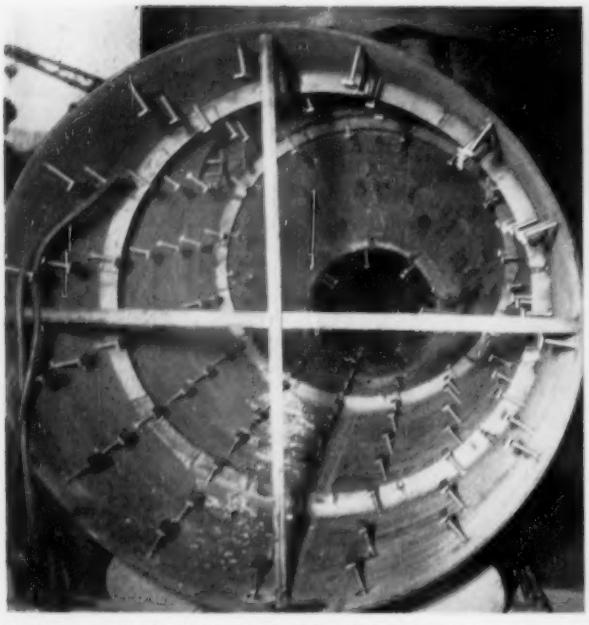
9. All authorities agree that the success of a monolithic lining of any type depends about 90 per cent or more on workmanship and attention to detail. This puts a high premium on supervision and inspection during installation and requires the utmost in craft skill and ability.

Inspection and Repairs

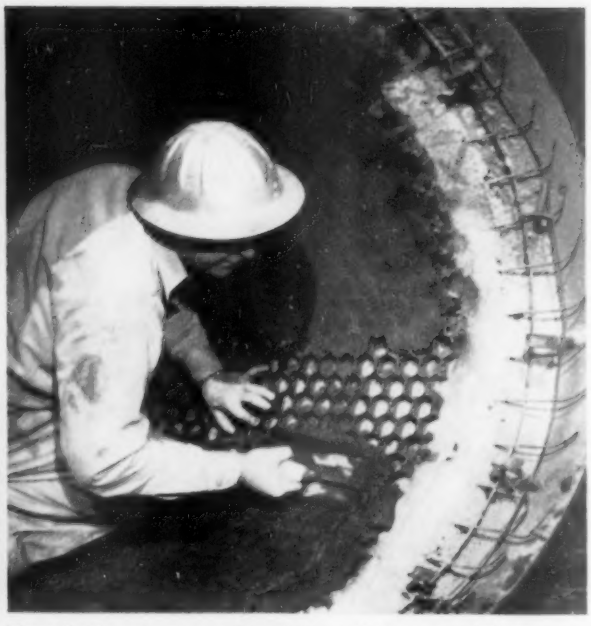
Metal wear plates . . . Erosion attack on metal wear surfaces may be either general or localized, possibly both. Localized attack is the more serious in that once gouging of the metal starts, penetration appears to be self-accelerating. Gouged areas are repaired by depositing weld metal and grinding to a smooth surface. The latter is necessary to minimize turbulent flow conditions which might lead to further gouging.

Severe secondary erosion has taken place when the catalyst has found a path between the wear plate and the pipe weld. This does not always occur at the leading edge and may take place along the side of the wear plates in a bend. If such erosion is suspected, portions of the wear plates should be removed so that the pressure wall can be inspected.

Supported castable wear plates . . . These usually erode more uniformly than metal surfaces. For this reason they are easier to maintain and repair and are generally replacing metal wear surfaces. The liner is first inspected for cracking and spalling of the castable. Where replacement is necessary



Various steps in installation of insulation lining are made. A layer of cement may be applied against the shell. Fig. 4.



Normally the refractory and insulating castables are applied by pneumatic gun but where space is limited hand application may be necessary. Fig. 5.

all of the old castable must be completely chipped out to the bare metal shell.

Merely refinishing and touching up deteriorated areas is not satisfactory as sufficient bonding will not be secured. Complete replacement of the steel mesh and castable liner usually is made when the thickness of the liner has been reduced to half (from ¾-in. to ⅜-in.) by uniform wear.

In locations where erosion is particularly severe some refineries have installed two layers of steel mesh to insure a full operational run of the unit. In other sections of the same line where erosion is less severe, one layer or possibly no lining at all is used. Where this is done, it is important to have a smooth transition between the different thicknesses of lining since sudden changes in diameter or inner pipe contour result in severe local erosion. Steel jumper strips frequently are used to provide a transition at points of varying diameter.

Heat-insulating linings . . . A check on the performance of insulating linings is made more of less continuously during operation through periodic temperature surveys of the external shell metal temperatures. Locations where the insulating linings have deteriorated usually are conspicuous as the paint will blister or char. The paint likely will discolor in areas which are somewhat above normal but are not hot enough to blister or char.

Questionable locations are then checked internally during the next turnaround. Wherever refractory has fallen from the steel mesh or is cracked, a careful check of the insulating castable for possible channeling of vapors should be made before making repairs. Where a deteriorated spot is found, a sufficient area should be removed to insure that adjacent areas are sound.

Special Maintenance Problems

Some conditions of catalyst flow cause rapid deterioration of the steel mesh and supported castable linings. They are:

1. Velocities above 125 ft. per second in dilute phase lines.
2. Velocities above 6 ft. per second in dense phase lines.
3. Coarse grain catalyst.
4. Turbulent flow.
5. Change in direction of flow.
6. Any combination of the above conditions.

Conditions No. 1 and 4 exist in linings downstream of orifices. Fig. 6 is a photograph of the inside of a 90° bend in a regenerator flue-gas line. An orifice had been installed in this line just upstream of the bend which resulted in the lining being subjected to the worst possible combination of erosive conditions, i.e.—extremely high velocities, turbulence, and change in direction.

The orifice was relocated to a straight section of the line and a 15-ft.-long steel liner was installed on the surface of the monolithic lining just downstream of the orifice. It has been found that a smooth steel liner holds up better in this particular case than does the refractory liner.

Another special maintenance problem was encountered in a low-density catalyst carrying line where catalyst surges or "slugging" were often encountered. After some study, it was concluded that the pressure bumps due to catalyst slugging were causing the surface layer of the monolithic liner to flex between support points (studs) until failure by fatigue occurred.

The problem was overcome by two measures. First, additional studs were provided to reduce to one-half the surface layer span between studs, and second, ⅛-in.-diameter steel wires were installed through the clinch holes in the steel mesh, so that each refractory hexagon was securely anchored in place.

In general, monolithic linings and wear plates are particularly susceptible to damage by vibration and it is essential that any source of vibration be eliminated in connection with these installations.

Materials . . . The greatest amount of experience with monolithic linings and wear plates has been with hydraulic-setting castables. Most such castables consist of a fire-brick grog mixed with a binder, usually a calcium aluminate cement. These refractories can be cast, troweled, or applied with a pneumatic gun. Where maximum density is desired, the refractory should be gunned or a stiff mix made and rammed into

HOT SPOTS MAY CAUSE—

1. Ultimate failure of the vessel or line.

2. Spread of initial internal failure.

3. The need for emergency shutdown.

4. For lines, the effect of abnormal thermal expansion.

the mesh. With all hydraulic setting castables, it is important to keep the amount of water to the minimum required for proper application in order to develop maximum strength after curing.

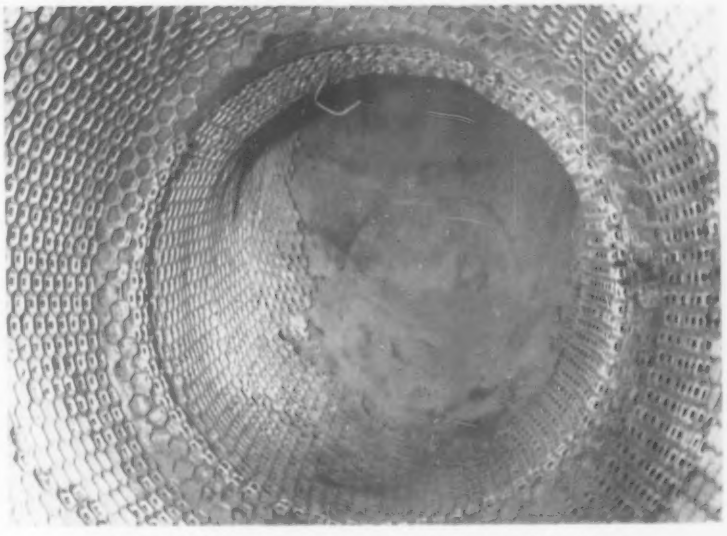
Calcium aluminate cement actually was developed for higher temperature applications than are encountered in fluid catalytic cracking units. Nevertheless, experience indicates that the strength obtained under normal operating temperatures is adequate so that mechanical failures from this cause alone have never been a major source of trouble.

Some sources have suggested that a high-early-strength portland cement be used as a binder instead of the calcium aluminate cement. One such installation was made in a flue-gas line at the point where water sprays are used to reduce the flue-gas temperature. The combined effect of water spray impingement, corrosion, and erosion had made it extremely difficult to maintain the liner at this point.

In this instance, the portland cement served better than refractory castable or steel wear plates used previously. Portland cement should not be used where it will be exposed to abnormal runaway temperatures, however, as it loses strength rapidly above 1,100°-1,200° F. and eventually powders at higher temperatures.

Aggregate substitutes . . . As an alternative to using firebrick grog aggregate in the refractory castable, other materials such as chrome ore-magnesite spinel or high alumina refractories have been suggested on the basis that harder particles will provide greater resistance to erosion.

It has been observed through laboratory and plant tests that the binder or matrix may erode first leaving exposed particles of the aggregate which finally become disengaged due to loss of surrounding binder. Hence, the use of more erosion-resistant aggregate may not actually result in any improvement in over-all erosion resistance since the binder appears to be controlling.



The inside of a 90° bend in a regenerator flue-gas line. Fig. 6.

There are several new products on the market having extremely hard aggregate and a compatible binder, however, for which preliminary results are very promising.

Silicate cements also have been used in monolithic linings and erosion-resistant wear plates. These cements after mixing are air-setting materials of thick consistency which are applied by troweling. Since they set up in 20 to 30 minutes, only small batches can be mixed and troweled at a time which makes the installation somewhat tedious and requires careful supervision.

These cements freeze at about 20° F. and set up at temperatures below 50° F. so that they cannot be exposed to cold weather. The preferred temperature range for mixing and applying is 60° to 70° F. Steam cannot be used directly to heat the cement because contacting water will make the cement sloppy.

Despite these difficulties in installation, the surface obtained with proper installation is extremely hard, smooth, and gives somewhat superior resistance to erosion. This material has given superior results in the vicinity of water spray injection points in flue gas lines, which is an extremely difficult service.

In summary, experience to date indicates that the hardest, densest, and most tightly packed materials offer the greatest erosion resistance. The silicate cement refractories because of their fine grain structure appear to be more erosion resistant than the gunnable refractories.

The hydraulic-setting castable refractories, while not quite up to certain other materials, usually are adequate for normal conditions in fluid catalytic cracking plants. It has been observed that under severe erosion conditions, the castable refractories will erode away below the steel-mesh grating, whereas silicate cements and plastic materials erode evenly with the mesh.

In general, so far as materials are concerned, it must be realized that most if not all of the materials being used today were made originally for applications of a totally different nature from conditions in catalytic cracking units. Hence the user may be taking considerable liberty in applying them to this service, and the experience which results very likely will have no connection whatsoever with the performance of the material in the service for which it was intended.

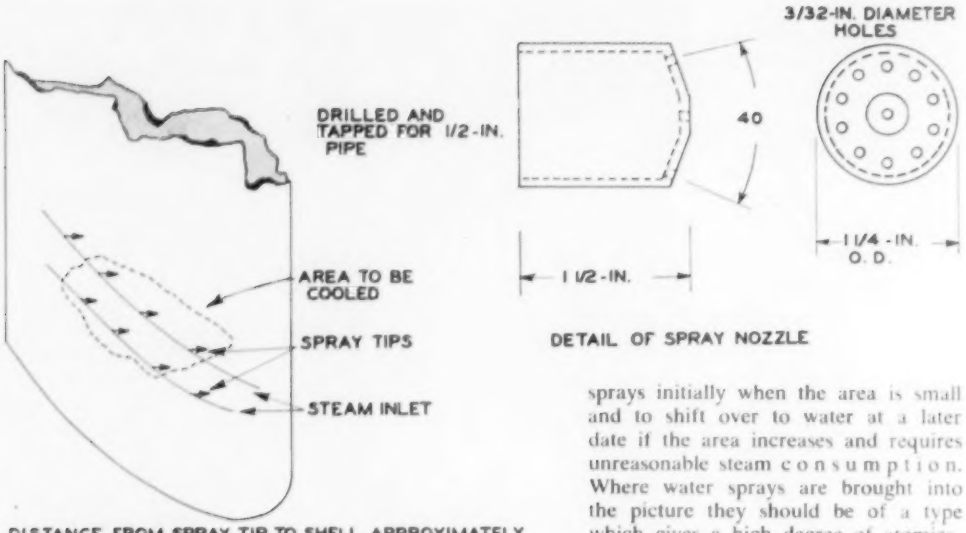
Hot Spots on Vessels and Lines

Hot spots have been experienced on vessels and large piping in catalytic cracking units due to failure of the internal heat insulating liner. This frequently results in shell metal temperatures of 1,000° F. or above.

In the early years of catalytic cracking plant operations when liners were constructed of tile and block insulation, the appearance of a hot spot of any appreciable area usually was indicative of the onset of a major lining failure that would spread rapidly. In view of this, the unit was brought down as soon as possible for repairs.

The development of the supported castable lining and the demonstrated use of steam and water cooling to control large areas of excessive metal temperature have combined to greatly reduce the need for shutdowns from this cause.

The principal points of concern in connection with hot spots are:


3/32-IN. DIAMETER HOLES
DRILLED AND TAPPED FOR 1/2-IN. PIPE
40
1 1/4 - IN. O. D.
1 1/2-IN.
AREA TO BE COOLED
SPRAY TIPS
STEAM INLET
DETAIL OF SPRAY NOZZLE
DISTANCE FROM SPRAY TIP TO SHELL APPROXIMATELY 6 IN. TO 10 IN.
DISTANCE BETWEEN SPRAY TIPS APPROXIMATELY 10 IN. TO 12 IN.

Typical steam spray installation and the type of nozzle employed. Fig. 7.

1. Ultimate failure of the vessel or line due to excessive stress.
2. Spread of initial internal failure to more extensive areas.
3. The need for emergency shutdown to make repairs.
4. For lines, the effect of abnormal thermal expansion on connecting equipment and in the line itself, including components such as expansion joints.

Detection . . . The first appearance of an area of excessive metal temperatures usually is discovered either by operating personnel in their shift checks of the unit, or by an inspector during routine temperature surveys. On vessels and lines having internal insulation, no external insulation is used except under very special circumstances. The paint on the outside surface, therefore, provides an immediate indication of the development of a hot spot.

Procedures . . . When an abnormally warm spot is discovered, the highest temperature and total area should be determined immediately. After obtaining all possible information, each case should be considered separately and a decision as to appropriate action made.

Alternatives are to shut the unit down, to continue operation using steam or water sprays to reduce metal temperature to a normal level, or to take no action at all pending further developments.

In the last-named case, arrangements should be made to check the status of the affected area at regular intervals. On occasions, thermocouples have been attached to the surface in the hot area and the temperatures recorded continuously to observe any changes.

Control of Hot Spots

Both water and steam sprays are employed commonly to limit metal temperatures where hot spots have developed. The choice depends mainly on such factors as the area of the hot spot, the maximum temperature, and the location of the hot spot.

In the early experience with hot spots, steam was used as the cooling medium. Steam has an advantage over water with regard to shock chilling the metal surface. Its disadvantages are mainly that much larger quantities are required, the reduction of metal temperature is not as great, and the cooling process is apt to be adversely affected by wind conditions.

Water sprays . . . Cases were ultimately encountered where the area was so great that unreasonable quantities of steam were required. Water sprays were then used with success and have continued to be used where the area to be cooled is large.

A general policy which should be followed in the use of water sprays is that if there is an interruption in the supply of water the area should not be subjected to another temperature cycle by reapplication of the water. This means that plant operation should be discontinued and the unit brought down immediately on an emergency basis.

Another disadvantage not to be overlooked in the use of water is the difficulty of collecting the runoff.

The most generally used procedure in controlling hot spots is to use steam sprays initially when the area is small and to shift over to water at a later date if the area increases and requires unreasonable steam consumption. Where water sprays are brought into the picture they should be of a type which gives a high degree of atomization of the water so that the discharge is like a dense fog.

A direct water stream or sprinkler nozzle should not be used under any circumstances. Where a changeover is made from steam sprays to water sprays it is advisable to cut the steam sprays out gradually after all of the water sprays have been put in operation one by one.

Installation . . . Experience has indicated that on small hot spots a single 110-psi. steam hose, suitably supported, is adequate. With more extensive areas a temporary structure should be built around the hot spot to which as many nozzles as required may be clamped. Fig. 7 shows a typical steam spray installation and the type of nozzle employed.

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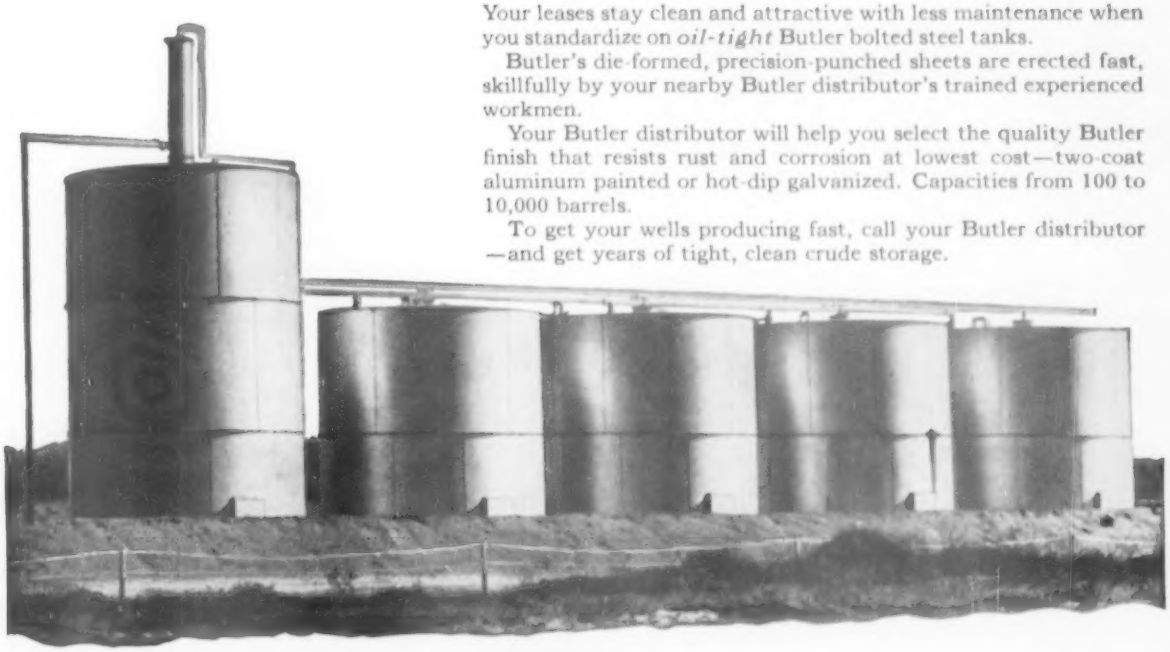

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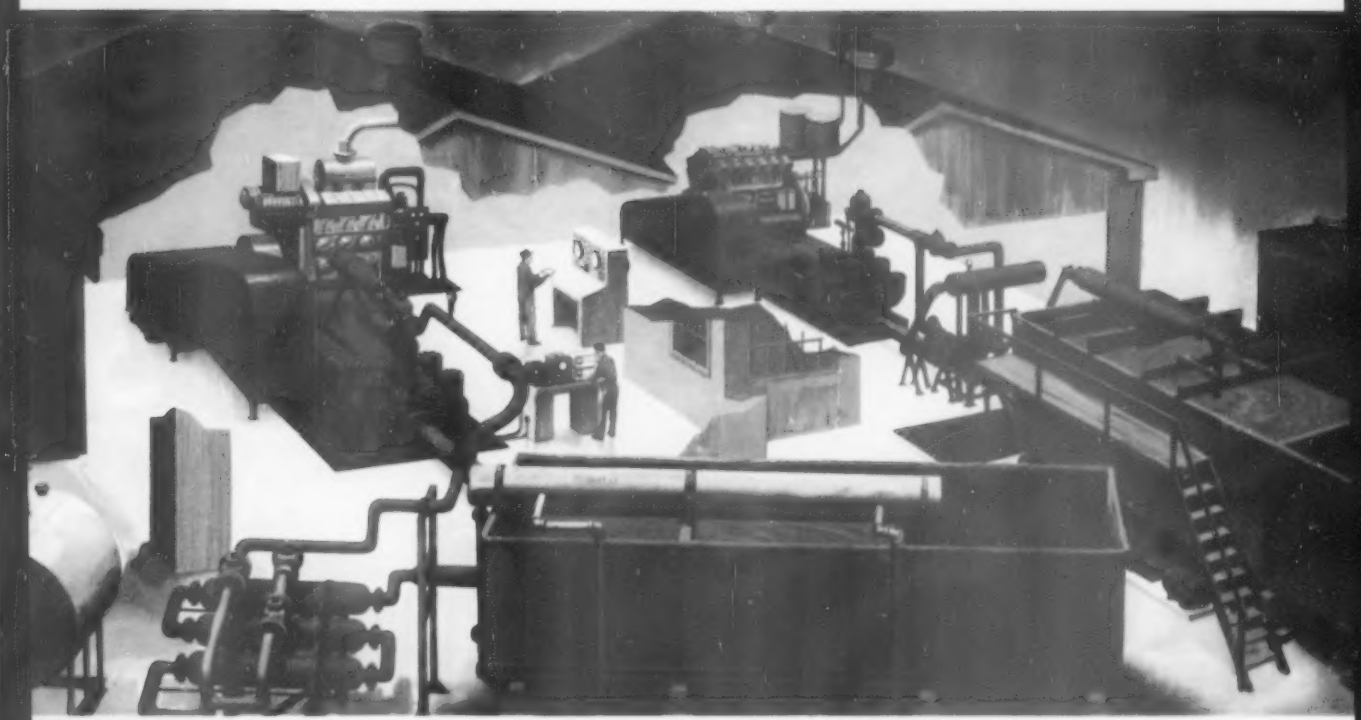

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Channeling Acid has proved its effectiveness in smoothing out production decline curves–treatment after treatment.

For example, a well originally completed in a dolomitic limestone formation in 1939 was given a standard acid treatment in 1950. Tests indicated 15 BOPD pumping. In 1952 Dowell engineers recommended Channeling Acid to increase production. The treatment consisted of 1500 gallons of Channeling Acid followed by 10,000 gallons of silicate control acid. Production increased to test 114 BOPD pumping. *More than three years later the well is still an excellent producer, pumping its allowable of 38* BOPD.

Channeling Acid is an exclusive Dowell treatment that creates new passages for oil trapped deep in formations. Chemical agents make this possible by temporarily sealing off most of the pore spaces, allowing the acid to direct its attack on certain pores and form long drainage channels. The film-forming agents then break down and flow freely to the well bore.

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DILUENT is injected through hollow sucker rods. The plunger pump near the rear of the beam boosts diluent pressure to 400-500 psi.

THIS DUAL-RAM 10-ft.-stroke hydraulic unit sends diluent through hollow sucker rods to mix with low-gravity crude in a specially designed liner pump.

PULLING THE WELL is messy work. Sticky crude forms blobs on the rods and tubing rather than draining off. Injection of diluent reduces the problem.

Diluents Permit Faster Pumping Speeds

. . . and give other production benefits

by D. H. Stormont
District Editor

DILUENTS are offering invaluable aid at hundreds of rod-pumped wells in several California low-gravity oil fields.

In some cases the diluent increases oil output by permitting faster pumping speeds. At a few wells producing highly viscous crudes, output depends entirely on the use of cutter stocks—the rods will not fall otherwise. Added benefits from their use are reduced rod loads, lower surface pumping pressures, and easier treating.

Viscous resistance to flow is a critical factor in producing low-gravity crudes. Rod loads on the upstroke are increased due to viscous drag at the pump plunger and rod boxes, in addition to that at the tubing wall. On the downstroke these viscous forces result in the rods falling much more slowly. About two-thirds of the cycle sometimes is required for the rods to fall; there is no need for counterbalancing.

Diluent action . . . Bottom-hole temperatures usually are sufficient to keep the crude mobile in the lower portions of the hole. But near the surface the crude becomes more viscous as it cools. Diluents are helpful in reducing viscous resistance in the pump plunger but their greatest benefit is believed to be given in the cooler upper portions of the wells.

In most wells the diluent is injected down the casing annulus. Use of hollow sucker rods or macaroni tubing, to gain more uniform mixing, is increasing, however.

A gas-oil fraction is the most widely used cutter stock. But materials ranging from light crude oil to propane are used.

Coastal fields in the Santa Maria area are receiving most of the diluents. Among these are Guadalupe, Santa Maria Valley, West Cat Canyon, and Zaca Creek. They are also extensively used in the large San Ardo field in Monterey County, and in some low-gravity wells in the San Joaquin Valley and Los Angeles Basin areas.

Guadalupe Experiences

Most of the 50 wells completed by Union Oil Co. in Guadalupe field can be satisfactorily pumped without using diluents. About a dozen downstructure wells, however, produce 9° to 11° crudes which must be diluted if reasonable pumping speeds are to be attained.

A 27°-gravity coker distillate from Union's nearby coking plant is used, with an average of approximately 5 bbl. daily being injected in each well. This volume raises the gravity of the crude only about 2° A.P.I. but cuts the viscosity almost in half. Wells which normally can be pumped at only 0.8 to 1 s.p.m. thus can be operated at 2 or 3 s.p.m.

Average crude output of the 2,600 to 3,200-ft. wells is 50 bbl. daily, with some producing as much as 200 bbl. daily. The water cut averages about 10 per cent but sand cuts range as high as 50 per cent. Gas-oil ratios average 900 cu. ft. per barrel. All wells are rod-pumped with 6 or 10-ft.-stroke hydraulic pumping units. Where heavy lifting loads are encountered, dual-ram units with a polished-rod rating of 24,000 lb. are used.

Hollow rods . . . One well equipped with a dual-ram unit uses hollow sucker rods and a 2½ by 2¾ liner pump designed so that diluent can be injected between the standing and traveling valves. About 65 bbl. daily of 9°-gravity crude, plus a 50 per cent sand cut, is being lifted from 3,100 ft.

The diluent is injected down the 1-in. hollow sucker rods by means of a flexibly jointed 2-in. line connected to the hollow polished rod. A check valve just above the pump permits distillate to be injected only on the up-

PRODUCING

stroke. On the downstroke diluent is compressed into the crude. This assures thorough mixing of the two.

In some wells the cutter stock is injected down the casing annulus where it blends with the crude oil and is lifted through the tubing. Chief disadvantage of this method is that blending is not uniform. Slugs of light oil may accumulate and cause the sand to slough. An advantage is that the diluent tends to keep the outside of the tubing "slick," which makes for easier pulling jobs.

Problem of sand . . . In a few wells yielding large volumes of sand, production is through a 2-in. macaroni string run inside the 4-in. tubing. The distillate is injected down the tubing, using either motor or mechanically operated lubricators. Holes punched through the macaroni at the desired level permit the diluent to blend with the crude above the oil sand.

To minimize the sand sloughing problem, all wells are pumped at speeds which will result in a high fluid level being maintained. Normally about a 1,300-ft. level is maintained but in some wells a 300-ft. column is sufficient. Desirable fluid level for each well is determined through testing.

Santa Maria Valley

In nearby Santa Maria Valley field, Union also is injecting coker distillate at 15 wells on its Bradley Lands-2 lease. These 5,500-ft. wells produce extremely low-gravity crude, in the range of 6° to 7° A.P.I. The wells, pumped by heavy-duty air-balanced beam units with a 10-ft. stroke, cannot be produced unless diluent is used.

The distillate is stored at the lease in three 2,000-bbl. tanks. A motor-driven pump discharges the diluent at 120 psi. into a 2-in. distribution system.

At 11 of the Bradley Lands-2 producers the diluent is injected down the annulus between the tubing and casing. The other four wells use hollow rod strings to conduct the distillate about halfway down the hole. Bottom-hole temperature of these wells is about 180° F. Thus diluent is not required at the pump, which in most wells is set at about 5,200 ft.

The portion of the rod string below approximately 2,700 ft. is made up of solid rods. The diluent leaves the hollow rods through a perforated pony rod installed just above the solid rods. A check valve above the perforations prevents backflow of crude oil.

Diluent is injected down the hollow rods by means of beam-actuated injection pumps. From an intake pressure of about 100 psi., the diluent is discharged to the hollow polished rod at 400 to 500 psi. Through adjusting the plunger stroke of the injection pump, the volume introduced is regulated so as to constitute about 10 per cent of the well's crude production. An average of about 9 bbl. daily is injected at each of the four wells. This raises the gravity to 11° or 12° A.P.I.

Average sand cut of these wells is about 3 per cent. Though it tends to increase viscous drag at the pump, best operations are gained when pump clearances of 0.005 to 0.01 in. are maintained.

Diluting the extremely viscous crude produced from the Lombardi zone at San Ardo field accounts for the greatest volume of diluents used in any California field. At approximately 180 of its 240 wells completed in the zone, General Petroleum Corp. is injecting 1,500 bbl. of 31° gas oil daily. This increases the average gravity from 11.5° to around 13.5°. Average crude output of these 2,200-ft. wells is approximately 60 bbl. daily.

The diluent is piped to the field via a 42-mile line from a tanker terminal at Estero Bay. A field system distributes the cutter stock to storage tanks erected at high points throughout the Lombardi area. From the tanks the distillate gravitates or is pumped to the wells, where the flow is choked down to the desired volume.

High viscosity . . . Lombardi crude is among the most viscous of any California crudes. The native crude, averaging about 11.5° gravity, has a Saybolt furol viscosity of approximately 1,000 seconds at 122° F. Its pour point is 55° F.

Because of the high viscosity, diluent also is added on the suction side of transfer pumps at shipping batteries. At the pipeline station additional stock is added to lower the viscosity to 270-300 seconds. (S.f. at 122° F.) and to increase the gravity to approximately 14.5°.

Through injecting the gas oil at the well, not only are rod loads and flow-line pressures reduced but the treating problem also is simplified. Time required for the water to settle out is cut almost in half. Thus less storage is needed.

An unusual application of hollow sucker rods is used by The Texas Co. at the one San Ardo well—that of obtaining bottom-hole pressures. The pump is unseated and nitrogen injected down the hollow rod string. From the surface-pressure-gage reading required to establish a balanced condition the bottom-hole pressure then is calculated.

Propane Injection

Limited tests by one company in pumping low-gravity oil in high-angle slant holes have shown that pumping speeds and oil output can be substantially increased through continuous propane injection.

Output of these Los Angeles Basin wells was determined by the ability of the rods to fall. Though their productivity indexes were low, tests on several wells where the polished rods were hanging upon the downstroke showed there was from 1,000 to 3,000 ft. of fluid over the pump.

Crude produced from these high-angle wells averaged about 13° A.P.I. Air-balanced pumping units with a 54 or 64-in. stroke were used. Insert pumps with a 2-in. bore were used on combination ⅞ and ¾-in. rod stringers. Viscosity of the heavy crude, plus friction forces resulting from the high deviation angles, limited pumping speeds to some 7 s.p.m.

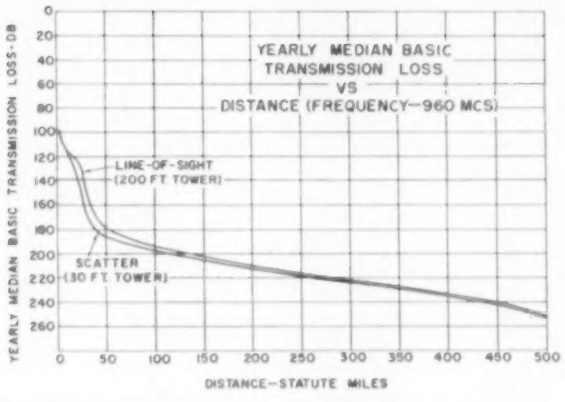
Continuous injection . . . The propane was injected into six wells through a common line using a propane lubricating system in which there were no mechanical moving parts to create a safety hazard. A macaroni string attached to the tubing conducted the propane to a level below the tubing insert pump. As bottom-hole pressures were in excess of the critical pressure of propane at reservoir temperatures, the propane as introduced into the crude was a liquid.

Through continuous propane injection it was found that pumping speeds could be doubled. This enables the average per well crude output to be increased about 15 bbl. daily. Initially much sharper increases were registered as the fluid level was pumped down.

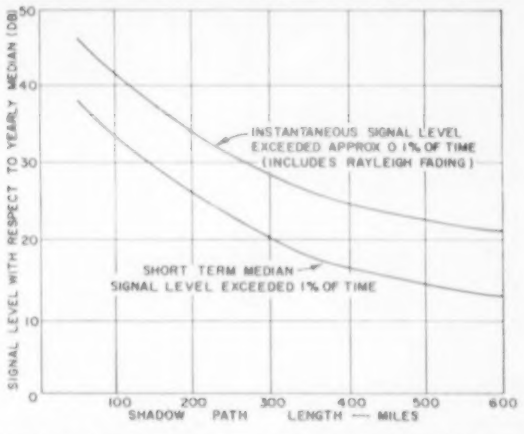
Before injection, maximum polished-rod upload on one well was 14,000 lb., minimum download 2,000 lb., average upload 10,000 lb. and average download 3,000 lb. Loads after the fluid level was lowered to the point where the well could be pumped off were: Maximum upload 14,000 lb., minimum download 2,500 lb., average upload 11,000 lb., and average download 5,000 lb. Polished-rod horsepower increased from 13.6 to 15.5 hp.

As no propane reached the liner perforation, its injection had no effect on well productivity. But its use did allow faster pumping rates and therefore, greater pump displacement. Actual pump volumetric efficiency remained essentially the same.

Much of the propane probably was lost in the wash and shipping tanks, which were not equipped for vapor recovery. It was estimated, however, that only 15 per cent of the propane (valued at 3 cents per gallon) would have to combine with the crude to make its use free.


YEARLY MEDIAN BASIC TRANSMISSION LOSS - DB
YEARLY MEDIAN BASIC TRANSMISSION LOSS VS DISTANCE (FREQUENCY—960 MCS)
LINE-OF-SIGHT (200 FT TOWER)
SCATTER (30 FT TOWER)
DISTANCE—STATUTE MILES

Yearly median basic transmission loss versus distance for frequency of 960 megacycles. Fig. 1.


MAXIMUM SIGNAL LEVEL ENHANCEMENT VS. PATH LENGTH
SIGNAL LEVEL WITH RESPECT TO YEARLY MEDIAN (DB)
INSTANTANEOUS SIGNAL LEVEL EXCEEDED APPROX 0.1% OF TIME (INCLUDES RAYLEIGH FADING)
SHORT TERM MEDIAN SIGNAL LEVEL EXCEEDED 1% OF TIME
SHADOW PATH LENGTH — MILES

Maximum signal level increase versus path length for both scatter and conventional microwave. Fig. 2.

A comparison of pipeline communication systems:

Relative Interference of Scatter Radio Systems

by R. M. Ringoen

Pipelines in the future will be using some form of scatter system for communication and the question of interference with other radio receivers is vital. The author says that scatter, contrary to general belief, actually causes less over-all interference and is more conservative of spectrum space.

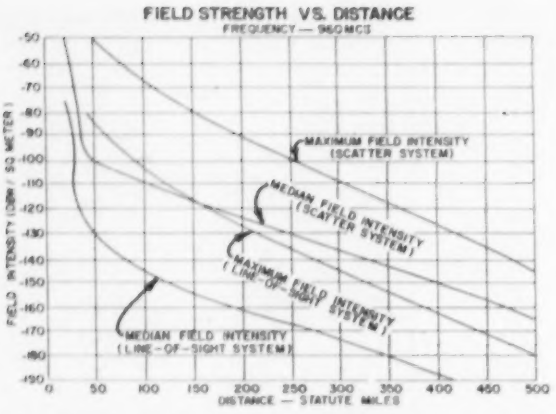
BECAUSE most ultrahigh-frequency (U.H.F.) transhorizon (scatter) communications systems employ transmitter powers of 1 kw. or greater, it is generally thought that they will produce interference greater than that of a line-of-sight relay system. Results of tests indicate that, contrary to general belief, line-of-sight relay systems are considerably more wasteful of spectrum than transhorizon systems. This should be an important factor in determining to what extent U.H.F. transhorizon systems should be employed in areas where spectrum congestion may exist.

The selection of the word "scatter" has probably been unfortunate in connection with transhorizon V.H.F. and U.H.F. propagation. Fear has been expressed that tropospheric scatter systems will light up the whole sky and interface with all other facilities on the same frequencies within hundreds of miles in all directions. This could hardly be further from the truth. However, to date little information has appeared in the litlerature concerning the actual interference which may be expected from tropospheric scatter systems.

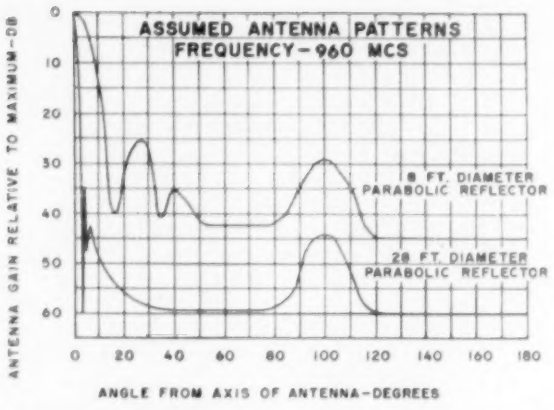
Potential users of tropospheric scatter systems have hesitated because of

Author is with Collins Radio Co., Cedar Rapids, Iowa. Paper was presented at the joint P.I.E.A.-P.E.S.A. meeting in Dallas, 1956.

Portable scatter microwave unit. Big antennas (these are 15 ft. in diameter) characterize transhorizon systems. Two are used to give space diversity reception.


FIELD STRENGTH VS. DISTANCE
FREQUENCY — 960 MCS
FIELD INTENSITY (DBW / SQ METER)
MAXIMUM FIELD INTENSITY (SCATTER SYSTEM)
MEDIAN FIELD INTENSITY (SCATTER SYSTEM)
MAXIMUM FIELD INTENSITY (LINE-OF-SIGHT SYSTEM)
MEDIAN FIELD INTENSITY (LINE-OF-SIGHT SYSTEM)
DISTANCE — STATUTE MILES

Curves showing maximum field strength versus distance for scatter and line-of-sight systems. These amounts will be exceeded only 1/10 per cent of the time. Fig. 3.


ASSUMED ANTENNA PATTERNS
FREQUENCY-960 MCS
ANTENNA GAIN RELATIVE TO MAXIMUM-DB
8 FT. DIAMETER PARABOLIC REFLECTOR
28 FT. DIAMETER PARABOLIC REFLECTOR
ANGLE FROM AXIS OF ANTENNA-DEGREES

Assumed antenna pattern for two sizes of parabolic reflectors. Fig. 4.

the general fear that such systems would soon consume all the available spectrum. By comparing the interference producing capabilities of a line-of-sight system and scattter system performing the same service, some conclusions as to the relative spectrum usage efficiencies of the two types of systems may be drawn.

Advantages of scatter . . . Many factors tend to make U.H.F. scatter systems produce less interference than comparable line-of-sight systems. First, a scatter system employs much longer circuit lengths while a line-of-sight system acts like a series of amplifiers along the path, producing high-intensity fields at specific intevals.

Second, a scatter system uses larger and better antennas which have much lower side lobes and narrower main beams.

Third, a scatter system is generally tailor-made to fit the circuit, in that the band width of the intermediate frequency amplifier in the receiver is specifically designed for the channel capacity required. This is not true in microwave systems and, in practically all cases, more band width than is required is employed in the radiofrequency (r.f.) amplifier. Also, the frequency stability of equipment used for line-of-sight systems is lower than that of equipment used for tropospheric scatter systems. Therefore, additional immediate frequency (i.f.) band width must used in the line-of-sight equipment to accommodate frequency drift.

Fourth, more sensitive receivers are used in the tropospheric scatter systems. With the much larger receiving antennas, this means that the tropospheric scatter systems require a lower field strength. Hence, the microwave system must produce a higher field strength at the last terminal in the system than must the tropospheric scatter systems employ compandors to improve the circuit quality further. These, in turn, reduce the received field strength requirements.

Finally, the line-of-sight systems in general will employ very high towers which will tend to make the propagation loss from the line-of-sight antennas less than that from the lower scatter-system antennas.

On the other side of the ledger is, of course, the fact that much higher transmitter powers are employed in U.H.F. scatter systems. However, the other factors mentioned will greatly offset the effect of this one item.

Method of Comparison

As a first step in comparing the spectrum usage efficiency of the two systems, it would seem in order to compute the interfering properties of a scatter system and a line-of-sight system performing the same specific service. This is what has been done.

The 960-megacycle region has been chosen. Both line-of-sight and scatter systems are available at this frequency. The comparison circuit selected is 130 statute miles with a channel capacity of 24 voice channels being required.

Specifications for line-of-sight systems:

Length of each of four hops: 32.5 miles.

Median basic transmission loss: 126 db.

Transmitter power: 5 watts.

Loss from transmitter to antenna: 3 db.

Antennas: 8-ft.-diameter parabolic at each terminal.

Antenna gain: 25 db.

Receiver band width: 2 megacycles.

Attenuation from antenna to receiver: 6 db.

Median received power at receiver input: —78 dbw.

Baseband: 12 to 108 kc. (24 voice channels).

Deviation ratio: 3.

F.M. improvement: 20 db.

Receiver noise figure: 10 db.

Receiver threshold: —121 dbw. (—116 dbw. at antenna).

For 45-db. channel test tone-to-noise ratio. Fade margin is 28 db.

Specifications for scatter system:

Path length: 130 statute miles.

Median basic transmission loss: 202 db.

Transmitter power: 1,000 watts.

Loss from transmitter to antenna: less than 1 db.

Antennas: Two 28-ft.-diameter parabolics at each terminal arranged for space diversity reception.

Antenna gain: 35 db.

Receiver band width: 1 megacycle.

Attenuation from antenna to receiver: 1 db.

Median received power at received input: —103 dbw.

Baseband: 12 to 108 kc. (24 voice channels).

Deviation ratio: 2.

F.M. improvement: 16 db.

Effective improvement provided by compandors: 19 db.

Receiver noise figure: 7 db.

Receiver threshold: —127 dbw.

For 45-db. channel test tone-to-noise ratio, fade margin is 24 db.

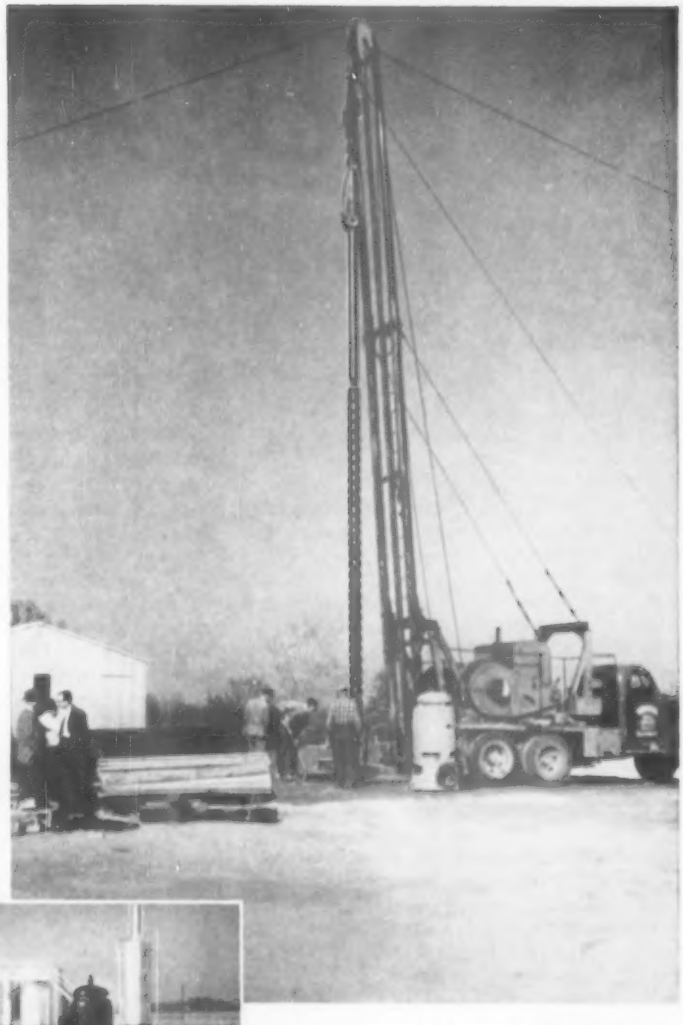
Circuit reliability: 99.9 per cent.

Field-Strength Computations

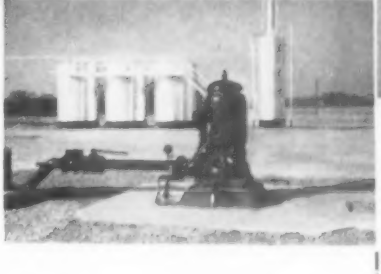
Basic to computing the field strengths which will be produced by systems operating at 960 megacycles, it is first necessary to derive a curve of basic transmission loss versus distance. Basic transmission loss is defined as the loss between two isotropic radiators. The curves of yearly median basic transmission loss versus distance used in the computations are shown in Fig. 1. Several sources of data have been used

PUMPS SOURCE WATER FOR SECONDARY RECOVERY FROM 1000 FOOT SETTING

PEERLESS PUMPS



A 1000 foot, 32-stage Peerless vertical pump being installed for source salt water pumping.



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LOCATION: Fayette County, Illinois. OPERATOR: Major oil producing company. NO. OF WELLS: 5. SETTING OF PUMPS IN WELLS: 1000 feet. HP OF MOTORS: 150 hp at 1800 rpm. CAPACITY: 10,000 bbls/day. TYPE OF PUMPS: 3 Peerless Water Lubricated Pumps, 2 Peerless Oil Lubricated Pumps; each are of vertical rotative shaft turbine type. PUMP CYCLING: Intermittent and continuous. PUMP MATERIAL: All iron.

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THE AUTHOR SAYS—

"To determine the area in which each system will produce signal levels of interfering magnitude, it is necessary to determine the field intensity above which interference will result. The field intensity used in the computations was determined by the noise level of the line-of-sight receiver.

in preparing these curves. In an article by Norton, Rice, and Vogler,[1] measurements on some 80 tropospheric scatter circuits have been analyzed and a resulting distance dependence curve obtained. Some information has been used from this article. Results of measurements made at Collins Radio Co. over circuits of 200 to 350 miles in length have also been used. In addition, the results of measurements made by Massachusetts Institute of Technology at distances out to 600 miles have been incorporated in the curves of Fig. 1.

The effect of the higher line-of-sight antenna is most noticeable at distances below 100 miles.

The yearly median basic transmission loss is of little actual interest when computing the interfering properties of specific systems. More significant is the field strength which is exceeded only a very small fraction of the time. Therefore, the curves of Fig. 1 must be modified to take into account anomalous propagation conditions.

In Fig. 2 is plotted the signal level increase as a function of distance. By adding the values in Fig. 2 to the transmission loss figures in Fig. 1, the transmission loss which is exceeded less than 1 per cent of the time may be obtained. Also plotted in Fig. 2 is the signal increase which may be expected when Rayleight fading is also taken into account. Due to Rayleigh fading the signal level which is exceeded 1 per cent of the time is 8 db. above the short-term median value. The upper curve in Fig. 2 may be assumed to be the signal increase which will be exceeded about 0.1 per cent of the time throughout the year.

This signal-level increase is caused by ducting conditions. Insufficient data are available on the variation in fading range as a function of distance at frequencies in the tropospheric scatter range. However, through analyzing data obtained by Collins Radio, M.I.T., and others, the curves in Fig. 2 have been derived. It should be understood that these curves may be in error by several decibels because of lack of complete data.

It is noted that the fading range decreases with distance. This is to be expected because during conditions of anomalous propagation, the shadow distance is shortened. A given shortening in terms of miles will have less and less effect on the signal strength at greater distances.

By using the curves of Fig. 1 and 2 and by using the transmission powers, transmission-line losses, and antennan gains cited in the specifications, the curves of Fig. 3 have been drawn. In Fig. 3 is plotted the field strength as a function of distance for both the line-of-sight and scatter systems. The curves denoting maximum field intensity for each of the two systems may be assumed to represent the field intensity which is exceeded less than .1 per cent of the time. Therefore, this field strength is the one of interest when considering the interfering properties of the two systems. These curves, however, are for field strength along the circuit path. To compute the total interference produced, the field strength over the entire region must be known. To obtain this information, the detailed antenna patterns for both systems must be specified.

In Fig. 4 are plotted the antenna patterns which have been assumed for the two systems. For the 9-ft.-diameter antenna with a beam width of 8°, information from manufacturers of 960-megacycle line-of-sight equipment has been used. However, for the 28-ft.-diameter antenna, no accurate experimental patterns were found to be available. Therefore, the pattern plotted for the 28-ft. antenna has been derived by computation and by measurments on antenna models at higher frequencies. The side lobe intensities and back radiation indicated are thought to be reasonable, but are not supported by any detailed measurements on 28-ft.-diameter antennas.

It is believed that in most actual installations, the radiation in the back direction from large antennas of the type used on tropospheric scatter circuits will result primarily from back scatter from the ground. In Fig. 4 it is indicated that the field in the backward direction is 60 db. below that along the circuit path. This is believed to be reasonable.

By using the antenna patterns plotted in Fig. 4, it is possible to obtain a plot of field strength over the complete area surrounding each of the terminals in the two systems.

Selection of Interference Field Strength

To determine the area in which each system will produce signal levels of interfering magnitude, it is necessary to determine the field intensity above which interference will result.

The field intensity used in the computations was determined by the noise level of the line-of-sight receiver. It is assumed that the field strength reaches an interfering magnitude when it will cause a signal to be present in the receiver for the line-of-sight system which will exceed the receiver noise when the receiving antenna presents an aperture of 1 sq. m. to the interfering signal. For the system being analyzed this field intensity value is —125 dbw. per sq. m. The selection of this magnitude is somewhat arbitrary.

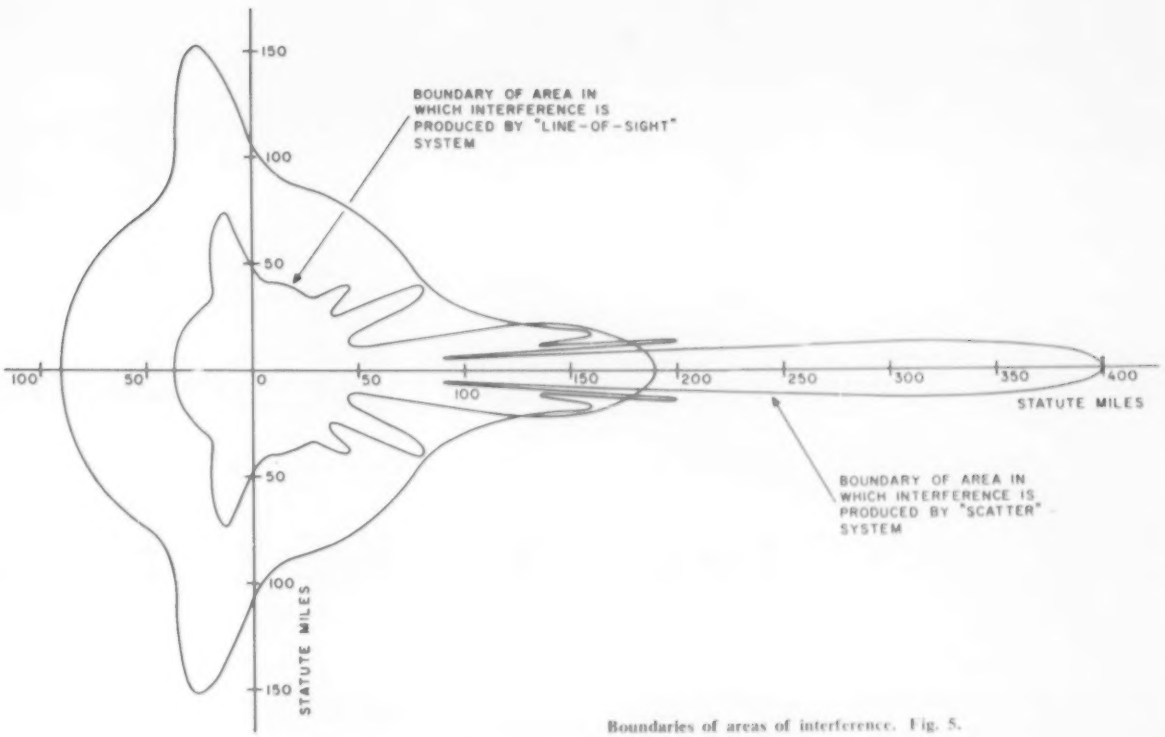
Finding Areas of Interference

By employing the curves in Figs. 3 and 4 along with the limiting field strength value of —125 dbw. per sq. m. the curves in Fig. 5 have been obtained. The area contained inside each curve represents the ground area over which a signal intensity of interfering magnitude, as caused by the specified terminal, will be present.

From Fig. 5, it is seen that the scatter system creates interference largely in a narrow strip along the circuit path. The interference extends much further along this path than does that of the line-of-sight system. However, the interference area for only the first line-of-sight terminal has been plotted. The successive interference areas from the remaining three terminals will each be displaced 32.5 miles along the circuit path.

New concept in interference . . . A measurement of the interference produced by each system must now be defined. In considering the total properties of each type of system both the ground area consumed and the band width throughout which interfering signals may be present must be considered.

The term "megacycle-square mile"



Boundaries of areas of interference. Fig. 5.

"The scatter system creates 37,500 megacycle-sq. miles of interference for each direction of transmission. In contrast the line-of-sight system produces 96,320 megacycle-sq. miles of interference."

has been chosen to denote the quantity of interference. This unit represents the product of the band width over 1 sq. mile of ground area, the interference produced would be 1 megacycle-square mile.

For the systems being compared, the line-of-sight equipment has an intermediate frequency band width of 2 megacycles. However, four hops are employed in this system. If the circuits are in line, it is improbable that any frequencies may be reused in the line-of-sight system. Therefore, it may be assumed that each terminal creates interference in a band width of 2 megacycles over the area shown in Fig. 5. The total interference in megacycle-square miles is then eight times the enclosed area. The band width of the tropospheric scatter system is 1 megacycle so the total interference produced is simply equal to the enclosed area.

Scatter Gives Less Interference

By integrating the areas enclosed by the curves in Fig. 5 and multiplying the result by the number of megacycles band width consumed for each case, a measure of the interfering properties of each of the type of systems may be obtained. The scatter system creates 37,500 megacycle-sq. miles of interference for each direction of transmission. In contrast, the line-of-sight system produces 96,320 megacycle-sq. miles of interference. These values are for transmission in only one direction for each system.

On the basis of this comparison, it must be concluded that systems employing tropospheric scatter propagation in the 890 to 960 megacycle range are not wasteful of band width when compared to present-day line-of-sight systems operating in the same frequency range. In fact, it is indicated that if scatter propagation were employed on all systems in the frequency range, the total circuit miles possible per given allocation band width would be 2.5 times more than if line-of-sight circuits alone were employed.

This conclusion is not without qualification since by improving the line-of-sight equipment, its interference-producing capabilities may be reduced considerably. For instance, if more sensitive receivers were employed in the line-of-sight systems, less transmitter power would be required. Also, if better antennas were used, the area of interference would be reduced. In addition, if higher frequency stability equipment were employed in the line-of-sight systems along with somewhat lower deviation ratios, the band width could be reduced considerably.

All of these things would improve the position of the line-of-sight equipment in comparison to the tropospheric scatter system. However, soon the economics of the situation would come into play and the line-of-sight equipment would become much more expensive than tropospheric scatter equipment for performing the same service.

The foregoing analysis may be considered as just a start towards analyzing the actual interfering properties of tropospheric scatter systems. Considerably more information needs to be known on fading range as a function of distance, detailed antenna patterns, propagation loss versus distance, etc. However, the results are thought to be encouraging to those who think that tropospheric scatter propagation should not be overlooked, even in the United States, for communications systems where circuit lengths in excess of 70 or 80 miles are required.

Reference

1. K. A. Norton, P. L. Rice, and L. E. Vogler, "The Use of Angular Distance in Estimating Transmission Loss and Fading Range for Propagation Through a Turbulent Atmosphere Over Irregular Terrain," Proc. I.R.E., October 1955.

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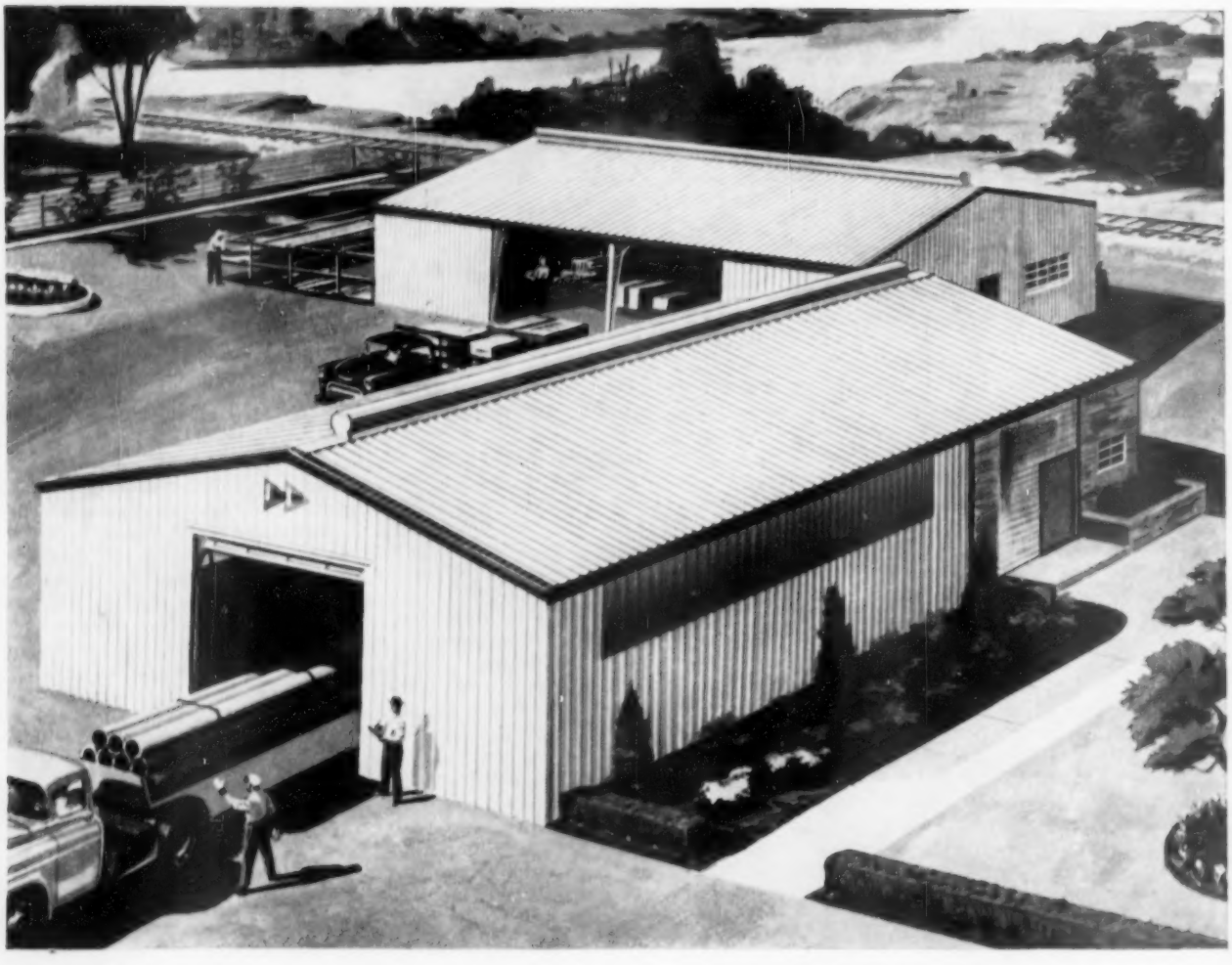

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ELECTRONIC COMPUTERS such as these will enable geophysicists to process gravity and magnetic data more quickly.

Electronic Computers Aid Geophysical Interpreters

by Dr. E. G. Kogbetliantz

NEW geophysical possibilities are available with the introduction of modern electronic computers. This computing equipment merely facilitates and speeds up the purely arithmetical work related to the handling of geophysical data. But the new machines perform this work rapidly enough to consider additional terms in all approximate expressions used.

Practically, there is no limit to the number of operations the machine can perform; thus many more terms can be considered in all the approximate expressions used. The map area can be subdivided into many more regions, and inside each region a special approximate formula can be constructed. All this enormously increases the power of old, known methods; in addition, this makes possible the practical use of new methods based on extensive computations, such as, for instance, Grant's method, thus enabling a much better interpretation.

Moreover, field data made at irregularly distributed stations can be interpolated at points of a square or triangular grid with amazing speed and accuracy. This makes easy the interpretation of immense backlogs of magnetic and gravimetric field data gathered by many oil and mining companies which have not yet been analyzed. Once the grid values are obtained, maps of first and second vertical derivatives or continuation downward are easy to compute by electronic computers.

Imagine a geophysicist, head of a crew, cabling the data of a preliminary survey to his company and receiving, 2 or 3 days later, many maps deduced from his data; map of regional anomaly, map of residual anomaly obtained by removing the regional, a set of maps of first and second vertical derivatives computed at various depths, another set of maps of continuation downward to various depths also. His crew is still there, ready to continue the survey, and naturally will now give the best results possible because the rapid interpretation of the preliminary data will give him a lot of important leads.

At present, no such method of field work is possible because, as a general rule, many months are lost for the computations. When the transformed maps are ready, the crew is already at the antipodes so that the survey's results cannot be improved by a new set of observations.

The continuations downward to different depths as well as the computation of derivatives at different depths imply the same operations performed on the grid values. The only difference consists in the set of numerical coefficients used which depend on depth. Thus, to take an example, the working time that a good electronic computer needs for the eight continuations downward to depths of ¼, ½, ¾, 1, 1¼, 1½, 1¾, and 2 miles (unit spacing of the grid being taken equal to 1 mile), would be only slightly greater than the time necessary to continue the map downward to one depth only.

Let us consider also the computation of free-air and Bouguer corrections based on an accepted numerical value D of average density. Too many correct readings of a gravimeter have been distorted by a wrong choice of this important parameter D. And then a wrong gravity map results from excellent field data. Very often it is important to know how much a map of regional or residual anomaly will change when the value of average density increases or decreases by one-tenth. If the set of data includes also the altitudes of stations, the preparation of the original map and its resolution into those of residual and regional anomalies can easily be repeated many times; each time a different value of average density D is used; thus each time different altitude corrections are made.

Instead of only one pair of regional and residual anomaly maps based on one value of D, a set of many such pairs can easily be prepared for various values of average density ranging from 1.7 to 2.2 for instance. Their comparison will help to avoid erroneous interpretations caused by a wrong choice of the value of average density used in computing the altitude corrections.

The general idea underlying these examples can be formulated as follows: the use of electronic computing equipment allows us to study how a geophysical picture based on the same set of field data changes in response to the variation of a geological parameter such as depth or density.

Aeromagnetic Surveys

As a final example of new possibilities, let us discuss the case of a new method of interpretation of aeromagnetic surveys. This was presented by its

The author is with International Business Machines Corp. This is an abridged version of a paper presented at the ninth annual midwestern meeting of the Society of Exploration Geophysicists, Fort Worth, and is published by special permission of the society.

author, senior geophysicist of the Compagnie Generale de Geophysique, Paris, (Schlumberger), Dr. Vladimir Baranov, at the joint annual meeting of A.A.P.G., S.E.G., and S.E.P.M. in March 1955, New York.

It is well known that all the maps of magnetic anomalies present a distortion due to the orientation and inclination of the normal earth's magnetic field. This distortion also shifts a magnetic anomaly so much that the connection between it and the geological feature creating this anomaly does not appear on the map. Such distortions are particularly harmful in the interpretation of aeromagnetic surveys. It is entirely possible, as shown by Dr. Baranov, to eliminate the distortion. The resulting magnetic map becomes as easy to interpret or as difficult if you wish as an ordinary gravity map. There is only one drawback in this powerful method: **the large amount of numerical computations needed.** The transformed values are expressed as double integrals of all field values; thus the number of double integrals to be computed is equal to the number of grid points in the network. With electronic computers, the numerical work can be done easily and rapidly and thus a backlog of aeromagnetic maps can now be analyzed. We know how large this backlog is.

Separation of Regional and Residual Anomalies

A gravity map represents always the combined effect of the basement and of relatively shallow tectonic features above it. It results from a superposition of localized residual anomalies upon the large regional anomaly due to the configuration of the eroded basement.

The knowledge of regional anomaly is needed to study the basement. On the other hand, correcting the original map for the regional anomaly yields a much better map of residual anomalies which are important for the study of the tectonics of the strata above the basement.

Therefore, it is very important to deduce from the map an estimate of regional anomaly as correct as possible. One well-known procedure consists in averaging the mapped values interpolated at grid points of a square or triangular network and considering these averages as the values of regional anomaly.

A study by Raymond Griffin (Geophysics, 1949, XIV, pp. 39-56) illustrates too well the complete arbitrariness of such a procedure: the results depend on the size and shape of the figure used and on the mesh unit (spacing of grid values). **By varying these factors, all values of regional anomaly can be obtained.** The preliminary interpolation itself is a very important source of errors.

Since in general the regional anomaly varies very slowly, we intend to represent it by a least squares quadric surface $f(x, y, z) = 0$. Here x and y are coordinates of the point, where a value z of the mapped quantity was observed. Thus, only station values are used and no preliminary interpolation is involved.

The equation of the quadric $f = 0$ is obtained from the original map by the method of least squares.

A least square plane is out of the question because the second vertical derivative of the regional effect expressed by a linear equation would vanish. Therefore, the second derivative map deduced from a residual map corrected in such a way for the regional effect would reflect again the combined effect of the basement and of shallow structures. No separation of regional and residual anomalies can be achieved in using a least squares plane representation of regional anomaly.

A representation of the regional anomaly by least squares surfaces of order higher than two is also possible. For instance, a special case of cubics of the form (V. Baranov, Sur une methode analytique de calcul de l'Anomalie Regionale, Geophysical Prospecting, Vol. II, 1954, No. 3, pp. 203-226),

$$z = P_3(x) + Q_3(y) + (ax + by + c)\,xy$$

is used by Southwestern Computing Service (Tulsa). The use of surfaces of higher orders is also described in the paper by C. Oldham and D. Sutherland (Geophysics, April 1955, p. 295).

Such representations of the regional anomaly, in our opinion, because of the flexibility of higher order surfaces, are strongly influenced by the shape of residual anomalies and tend to follow them so that the final equation of the regional anomaly pictures again another combination of both regional and residual effects.

It is hardly necessary to stress the utmost importance of the separation of regional anomaly. The study of tectonic features located above the basement by interpretation of residual anomalies becomes possible only after the resolution of the original map into two maps: map of regional and map of residual anomalies.

Once the nine coefficients of the quadric's equation $f(x, y, z) = Ax^2 + By^2 + Cz^2 + Dxy + Eyz + Fzx + Hx + Ky + Lz - 1 = 0$ are known, the value G of the regional anomaly at a point (x_o, y_o) is found by solving for z the equation $f(x_o, y_o, z) = 0$.

Using the Laplace equation $G_{xx} + G_{yy} + G_{zz} = 0$, the second vertical derivative G_{zz} of the regional anomaly G is easily obtained from the same equation $f(x, y, z) = 0$. Thus, the study of the basement is facilitated by mapping at all grid points the values G_{zz} of the second vertical derivative.

It is necessary to add that in case there is an important fault in the basement, the method just described cannot be applied to the whole of the map. Fortunately, the fault is always clearly indicated by the behavior of isogams. In this case, each one of two parts of the original map on either side of the fault must be treated separately; to represent the regional anomaly, two quadric surfaces are to be found, one for each of these two parts.

Interpolation of Station Values at Grid Corners

The interpretation of station values, even when they were already corrected for the regional effect, necessitates their preliminary interpolation at all points of a square (or triangular) grid. The correct interpolation of irregularly distributed data is the first and very important step in the interpretation of residual anomalies. In the past, this interpretation was accomplished by hand drawing the isolines and then estimating by eye the grid values at points lying between the isolines. Naturally, in such a procedure the results depend, in a very large measure, on the personal equation of the draftsman, even if the set of isolines is completed by drawing their orthogonal trajectories.

Performing the interpolation numerically guarantees the objectivity of the result. The method of least squares seems to be best for finding an adequate approximate representation of the observed quantity $g(x, y)$. It is not necessary to use orthogonal polynomials because the final result is the same as with some first terms of double Maclaurin expansion.

The accuracy of approximation depends on the number of terms used and it increases with the degree of polynomial used. An approximating polynomial of degree N:

$$P(x, y) = \sum_{n=0}^{N} \sum_{m=0}^{n} C_{nm}\, x^{n-m}\, y^{m}$$

has in all $(N + 1)(N + 2)/2$ coefficients. Three conditions should be fulfilled in order to achieve a sufficiently accurate approximation to $g(x, y)$ by $P(x, y)$:

1. The degree N of $P(x, y)$ and therefore the number of unknown coefficients C_{nm}, should be large enough.

2. Many different polynominals $P(x, y)$ of same degree w should be used, one per each of small regions into

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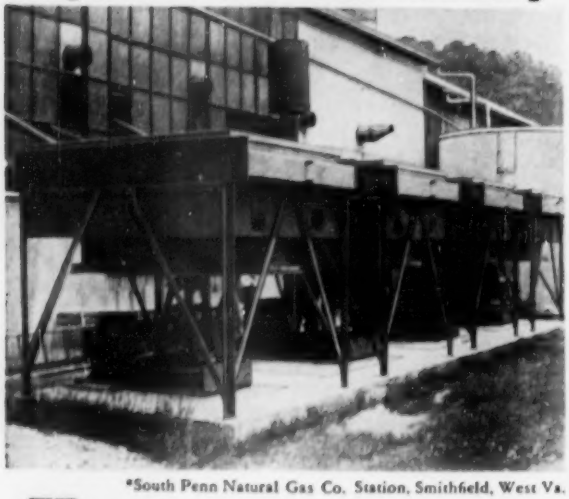

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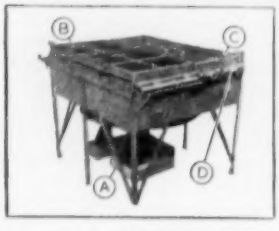

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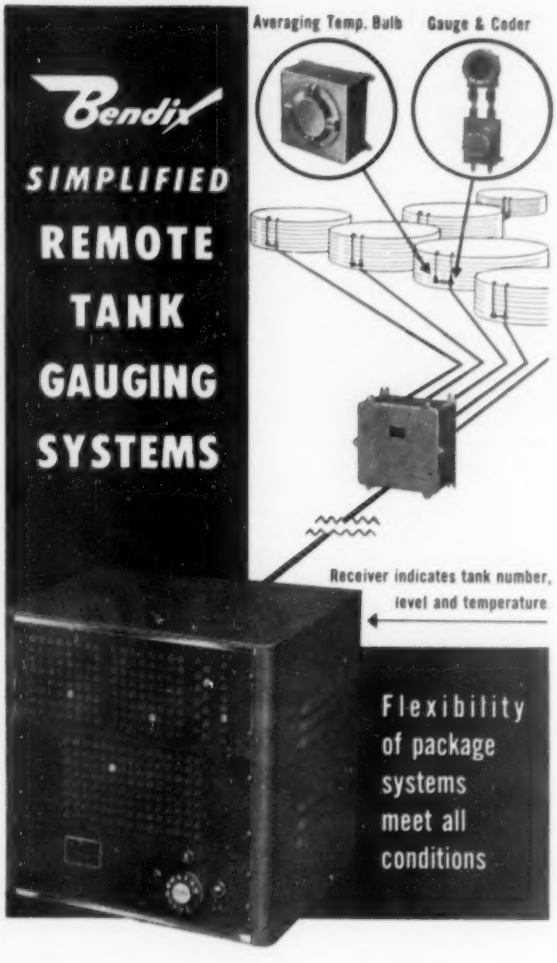
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which the total map area is subdivided.

3. The interpolated values of g (x, y), computed as values of P (x, y), should be retained and used only for the grid points in the central part of each of the small regions, since any interpolation loses its accuracy near the boundaries of the region for which it was constructed.

When these three conditions are fulfilled the amount of numerical operations necessary for estimating the grid values of g (x, y) becomes so large that the problem of correct interpolation can be solved with the aid of an electronic computer only.

Our method of interpolation has an important advantage: it gives not only the values of g (x, y) at grid points, but also those of its second vertical derivative g_{zz}. We have indeed, differentiating P (x, y):

$$-g_{zz} = g_{xx} + g_{yy} = P_{xx} + P_{yy}$$

$$= 2 \sum_{n=0}^{3} \sum_{m=0}^{n} A_{mn}\, x^{n-m}\, y^{m}$$

where the coefficients A_{mn} are simple linear functions of known coefficients C_{mn}.

Location of the Center of Gravity

One of the most interesting and promising possible uses of electronic computers is the determination of the total mass-excess (or mass-defect) and the location of the center of gravity of an isolated structure, such for instance as a salt dome which causes the anomaly. This anomaly is supposed to be a residual anomaly obtained by correcting the mapped anomaly for the regional effect; moreover, it should not overlap too much with other residual anomalies.

If such is the case, it is possible to compute the coordinates x*, y* of the vertical projection C* of the center of gravity C of the structure on the datum plane, as it is proved in our paper on quantitative interpretation of maps of magnetic and gravitational anomalies (see Quarterly of Applied Mathematics, Vol. III, April 1945, p. 62).

If the double integration is extended over the area of a circle of radius R and having its center O near the center of the anomaly (which in general is well marked on the map of second derivative) then, estimates of these quantities are as follows:

$$\bar{x}^* = P(r) \cdot \iint_{L(R)} x \cdot g(x,y)\, dS \Big/ \iint_{L(R)} g(x,y)\, dS$$

$$\bar{y}^* = P(r) \cdot \iint_{L(R)} y \cdot g(x,y)\, dS \Big/ \iint_{L(R)} g(x,y)\, dS$$

where $P(z) = 1 + r/2 + 3r^2/4 \ldots$ is a function of the ratio $r = z^*/R$.

Computing the three double integrals for an increasing sequence of values of R and choosing R in such a range (R_1, R_2) that the ratio $\overline{y^*}/\overline{x^*}$ remains approximately constant when R increases from R_1 to R_2, we can compute the values of P(r) for various pairs of values of R in (R_1, R_2) and obtain the corresponding estimates of z*, solving the quadratic equations for z* which are obtained using the quadratic polynomial $1 + r/2 + 3r^2/4$ as an approximate expression of P(r). This approximation is permissible if the value R_1 is large enough. If so, then r is small and the terms of order higher than the second are negligible.

Thus not only x*, y* but also the depth z* of the center of gravity can be found. Knowing z*, the mass-excess is computed as follows: If K denotes the gravitational constant 66.7×10^{-9} cgs., then the mass-excess m is:

$$m = \iint_P g(x,y) \cdot dS / 2\pi K$$

the double integration being extended over whole the infinite datum plane P.

But the integration over P is impossible. We replace it by the integration over L(R) and evaluate the contribution of the infinite region outside the circle of radius R in approximating the structure, cause of the anomaly, by a point source of mass m and at the depth z*. This yields the relation:

$$\iint_P g(x,y) \cdot dS = \iint_{L(R)} g(x,y) \cdot dS / (1 - r + 0.75 r (x^{*2} + y^{*2})/R^2 + r^3/2)$$

and therefore we have the estimate:

$$m = (2\pi K)^{-1} \cdot \iint_{L(R)} g(x,y)\, dS / (1 - r + 0.75 r (x^{*2} + y^{*2})/R^2 + r^3/2)$$

The same method applies to two dimensional cases. The map of an axial anomaly corrected for the regional affect is a family of nearly parallel isogams. Therefore, its interpretation deals with a typical profile (average profile) perpendicular to the strike of the elongated structure. To determine the position of the axis of the structure, it is sufficient to compute the abscissa x* of its projection point on the x-axis and its depth z*. In the two-dimensional case we use the relations:

$$x^* = \left[1 + 2r(1 + x^{*2}/3R^2)/\pi + 8r^2/\pi^2 - 2r^3(16 + \pi^2)/3\pi^3\right] \int_{-R}^{R} x \cdot g(x)\, dx \Big/ \int_{-R}^{R} g(x)\, dx$$

$$m = (2K)^{-1} \cdot \int_{-R}^{R} g(x) \cdot dx \Big/ \left[\pi - 2r(1 + x^{*2}/R^2) + 2r^3/3\right] \qquad (r = z^*/R)$$

which again allow the determination of x*, z*, and m, the last number expressing the mass-excess per unit of length.

Applying these two relations, it is important to be sure that the profile does indeed correspond to an axial anomaly. Two simple but very useful criteria, which hold for axial anomalies only, allow an easy discrimination between two-dimensional and three-dimensional cases. They are new, and we can only formulate them, omitting the proofs.

Let us denote the external values of the mapped quantity, magnetic as well as gravimetric, by M_1, M_2, M_3, since for an axial anomaly and on any profile nonparallel to the anomaly's axis there will be always three extremal values. If M_2 is positive (negative), then M_1 and M_3 are negative (positive). Let also D_1 denote the distance between M_2 and M_3, D_2—the distance between M_1 and M_3 and D_3—the distance between M_1 and M_2, so that always $D_2 = D_1 + D_3$.

We formulate now our two criteria. On any and every profile across the map of an axial magnetic or gravimetric anomaly, whatever the mapped quantity, the six quantities M_1, M_2, M_3, D_1, D_2, D_3, satisfy necessarily the following three relations:

$$(M_1)^{1/3} + (M_2)^{1/3} + (M_3)^{1/3} = 0$$

$$(M_1)^{1/3}/D_1 = (M_2)^{1/3}/D_2 = (M_3)^{1/3}/D_3$$

There is another curious criterion of axial anomaly which holds only for gravimetric surveys and involves the four quantities U_{xz}, U_{yz}, U_{xy}, and U_d measured at each station in a **torsion-balance** survey: if at each station these four quantities approximately satisfy the theoretically exact relation:

$$U_{xz}\, U_{xy}\, U_d + (U_{xz}^2 + 2U_{xy}^2)\, U_{yz} = 0$$

then the anomaly is due to an elongated structure (two-dimensional case).

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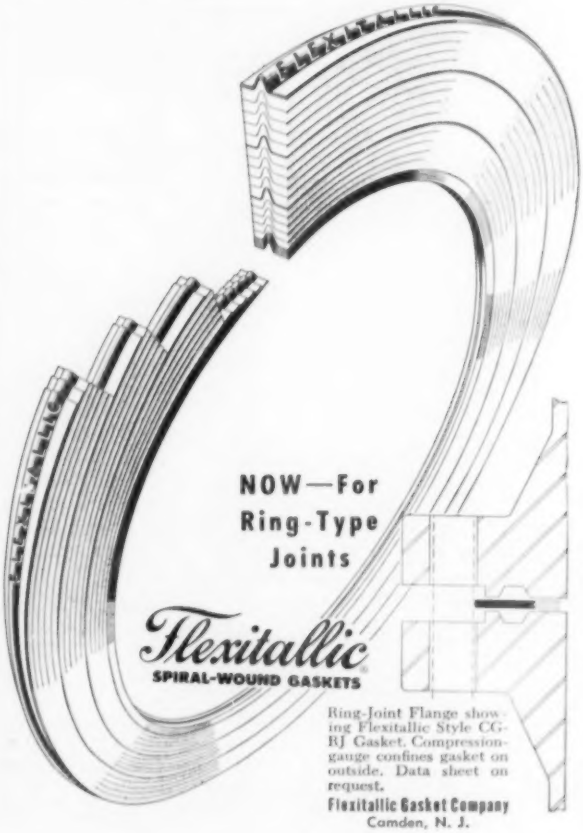

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How Side-Draw Towers Operate

THE disk and doughnut design is another type of baffle arrangement. A babble shaped like a doughnut is attached to the tower wall; a disk of slightly larger diameter than the opening in the doughnut is suspended a short distance above the doughnut. Rising vapor must pass through the open area between the disk and doughnut where it is contacted by descending liquid.

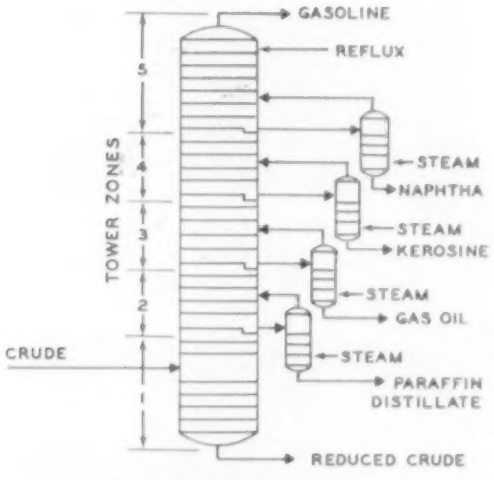
Packed towers consist of upright shells filled with loose pieces of solid material thrown in at random. Cylindrical rings of equal height and diameter known as Raschig rings are most commonly used for packing. The material of the rings may be carbon, porcelain, copper, iron, or other material, which will not be attacked or corroded by the material being processed. The packing provides a large surface over which the descending liquids may be distributed to obtain intimate contact with the rising vapors. Packed towers are very efficient when even distribution of the liquid and vapor is maintained. However, channeling is likely to occur in towers greater than 18 in. in diameter, with resulting loss of efficiency of separation. Modern practice in petroleum refining calls for packed towers mainly in absorption operations.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

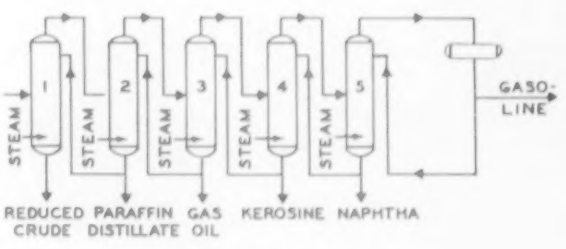
Side-draw towers . . . The side-draw tower may be defined as any tower that allows withdrawal of more than two desired products. The successive distillations occurring in the bubble-cap type of fractionator result in the segregation of a liquid composed of fractions of like boiling range on each tray. This condition allows the recovery of desirable fractions through drawoff pipes from the tower tray. Fig. 4 is an example of a side-draw tower in which six components of the crude charge are separated and withdrawn. Part of the liquid from the tray is withdrawn to a small fractionating vessel known as a stripper. Here the liquid is subjected to the action of stripping steam and the lightest hydrocarbons present are vaporized, fractionated on several bubble-cap trays, and are returned to the fractionator, usually several trays above the tray where it was withdrawn. Control is maintained in this way over the initial boiling point and the front-end distillation of the particular cut that is being handled.

In the side-draw fractionator, the overflow liquid on each of ths side-draw trays is divided. Part of the overflow goes to the next lower tray for reflux and the other part is withdrawn to a stripper. By comparing Figs. 4 and 5, it is apparent that the side-draw tower performs all the functions of a series of stills with tower zones 1, 2, 3, 4, and 5 of the fractionator in Fig. 4 counterparts to the stills 1, 2, 3, 4, and 5 in Fig. 5. By performing these five operations in one fractionating tower, considerable savings on heat, equipment, and space requirements may be made.

The operator of a distillation unit has as his major objective the separation of the feed stock into products meeting certain specifications. There are many factors that may affect the quality of products, but foremost among these are tower design, quantity of process steam, tower temperatures, and quantity of stripper draw.

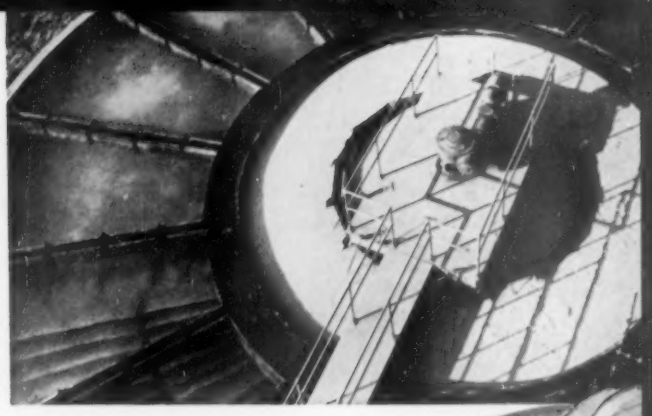


SIDE-DRAW tower. Fig. 4.



SERIES of stills. Fig. 5.

INFILCO high-rate treatment equipment is the sure cure for "oil in troubled waters"



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Accelerated treatment of such wastes has been a prime objective of INFILCO for over 60 years. You will find INFILCO equipment, with many exclusive features, includes the most efficient, compact units on the market today. Whatever your need, there is *high-rate* INFILCO equipment to meet it. Here are typical examples. You can depend on these units to—

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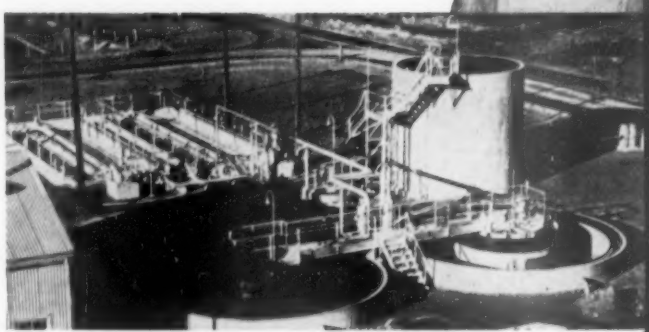

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0456

PORTABLE-GASOLINE-PLANT SYMPOSIUM—2

How One Operator Per Shift Runs the Plant

CLAYTONVILLE GASOLINE PLANT

by W. W. Pyeatt

A WEEKLY test of the neutralization number and viscosity of lube oil and oxygen content of engine stack gases is recommended laboratory procedure for proper maintenance of good compressor operations.

The Claytonville plant operation is automatic to the extent that for all pressures, temperatures and liquid levels, controls are provided. Anything which would tend to keep the plant running full time is provided to the best of the ability of the designers. Normal safety and shut-down devices are provided. There is no elaborate shut down or alarm system integrated in the plant control.

Specifically the Claytonville plant is equipped with automatic devices for the following operations:

1. Liquid-level control on inlet and interstage scrubbers.
2. Compressor suction pressure regulator.
3. Speed governor on compressors.
4. Liquid-level controls on all separation equipment.
5. Pressure control on gas stream, deethanizer, and stabilizer and fuel system.
6. Temperature control on transfer oil and glycol reboiler with **recording** temperature controllers on the deethanizer and stabilizer bottom product and the L.P.G. draw-off tray.

The plant is equipped with the following safety and shutdown devices:

1. High-level Mercoid shutdown on inlet scrubber and interstage scrubbers.

Over speed, high-jacket water temperatures and low oil pressure shutdown on engines.

3. Relief off the residue gas line ahead of booster compressor.
4. Low suction and high discharge pressure shutdown of booster compressor.
5. Normal relief valves for pressure vessels and lines in the plant.
6. Safety shutdown on the heater actuated by failure of circulation of oil to maintain proper pressure differential across the heater flow coil.

Reflux rate . . . The **one** manually controlled process step is that of adjusting reflux rate to the lower part of the stabilizer. Adjustment of this rate is infrequent.

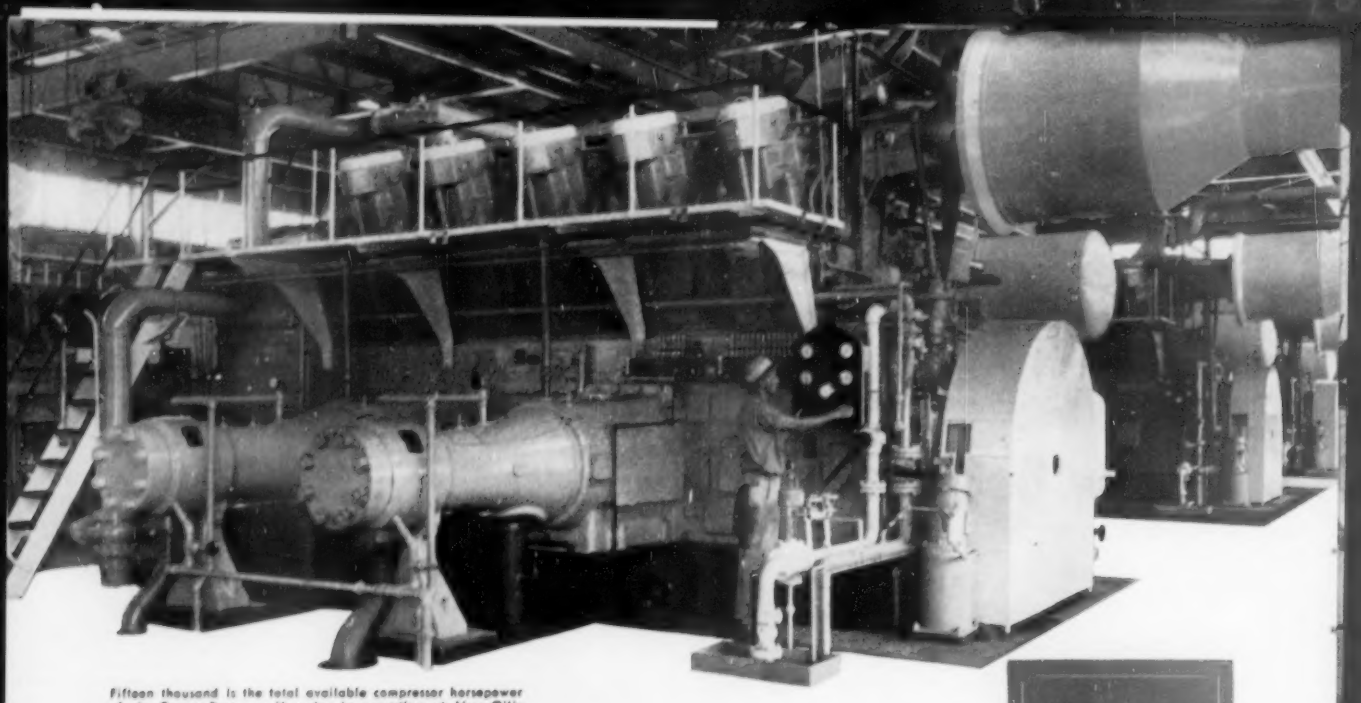
Automatic alarms to a remote area of integrated shutdown devices were not considered economically justified in this plant. Product sales by truck require almost constant attendance at the plant although the actual loading time is not great. By having one operator per shift it is possible to handle the marketing and plant operations as well as normal maintenance. The operator is usually able to correct the difficulties that would lead to a shutdown if unattended and thus avoid costly downtime.

Portability of the plant was given little consideration at Claytonville, partly due to the life expectancy of the field and due to the analysis of costs of the plant subject to portability. The compressor piping as well as that in the process area is such that it could be reassembled in another plant about as easy as that of the package plants. The installation costs of this plant including all the labor, supervision, foundations, trucking and erection of the compressors, and process equipment represented less than 8 per cent of the total plant cost.

Of this cost, a portion of the labor, supervision and essentially all the foundation, trucking, and erection cost would be lost in any movement of the equipment. Almost all the compressor piping and a part of the process piping was prefabricated in the field while foundations and other necessary work preparatory to receiving equipment was done.

Approximately 60 days elapsed between the starting of foundations and plant operation. These results substantiated the conclusion that it would not have been economical to have invested in extensive prefabrication from standpoint of cost, portability or construction time.

Author is with Claytonville Gasoline Co., Sweetwater, Tex. Paper presented at the N.G.A.A. thirty-fifth annual convention, Fort Worth, April 11-13, 1956.



Fifteen thousand is the total available compressor horsepower of six Cooper-Bessemer V-angles in operation at Lion Oil's big, modern Barton plant, not far from New Orleans.

Another Example of Efficient Power at Lower Cost

COOPER-BESSEMER V-ANGLES

"put the squeeze" on synthesis gas for a giant ammonia producer

At Lion Oil Company's $31,000,000 Barton plant near Luling, Louisiana; six 2500 hp Cooper-Bessemer V-angle compressors have gone to work compressing huge quantities of gas for ammonia synthesis.

Operating on a day and night schedule, these engine driven Cooper-Bessemers help produce 90,000 tons of nitrogen a year in the form of anhydrous ammonia and pelleted ammonia nitrate used as fertilizer.

One major feature of the Barton plant is the compactness of compressor equipment. Important reductions in piping, foundations, installation time and building expense are made possible by utilizing only six V-angle units to deliver 15,000 compressor horsepower.

Flexibility to meet varying conditions, durability for continuous operation and efficiency for low-cost performance are three more reasons why so many Cooper-Bessemers are found in similar outstanding plants throughout the nation. The nearest Cooper-Bessemer office will gladly help you select the ideal compressor to meet your particular needs.

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DIESELS • GAS ENGINES • GAS-DIESELS • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS

by W. L. Nelson
Technical Editor

COST-imating

16. Cost of Refinery Pump Equipment

THE horsepower of pumps may be computed from the following formulas:

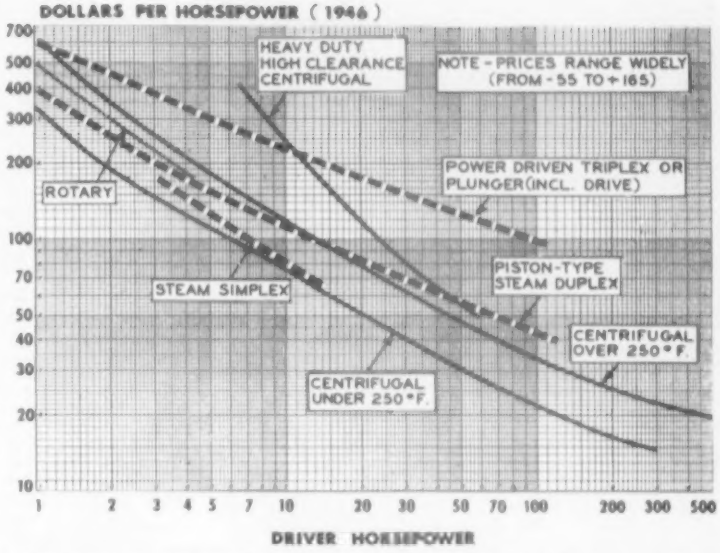
$$Hp. = \frac{\Delta PG}{1{,}713} = \frac{Ghd}{3{,}957} = \frac{Wh}{33{,}000}$$

in which:

ΔP = discharge minus suction pressure, psi.
G = capacity, g.p.m.
h = head, ft.
d = specific gravity of fluid
w = capacity, lb. per minute

One must divide by the efficiency of the driver mechanism to obtain the driver horsepower, and drivers capable of delivering more horsepower are usually purchased.

The figure[1,2] on this page shows the approximate cost (it ranges widely) of iron or steel refinery pumps including drivers, etc., such as motors, starters, gears, etc.



APPROXIMATE 1946 COSTS of iron or steel refinery pumps including motors, starters or drivers as required.[1,2,3] Fig. 1.

TABLE 1—EXTRA (1946) COSTS FOR SPECIAL MATERIALS FOR CENTRIFUGAL PUMPS

	—Per cent extra— Pump only	Pump and drive
All iron	5	
All bronze	50	53[3]
Stainless or monel	200-400	30[2,3]
Stainless (triplex)		32[2,3]
Case only:		
Cast steel	30-60	12-24*
Bronze	10-25	4-10*
11-13 chrome	60-100	24-40*
18-8 stainless or lead-lined	80-160	32-64*
Impeller only:		
11-13 chrome	5-10	2-4*
18-8 stainless	8-20	3-8*
Fittings and trim only:		
11-13 chrome	5-10	2-4*
Stellite	20-30	8-12*

*Approximate. Based on a pump cost of 40 per cent of the cost of the complete installation including motor and starter. †See Reference 1 for motor costs.

TABLE 2—EXTRA COSTS (1946) FOR TURBINE DRIVES OR EXPLOSIONPROOF MOTORS

Extra for explosionproof motors:	
1-5 hp.	$40 per motor
5-10 hp.	$50 per motor
10-100 hp.	$5-$7 per hp.
Extra for turbines (noncondensing):	
10-30 hp.	$35-$80 per hp.
30-100 hp.	$15-$35 per hp.
100-300 hp.	$ 8-$15 per hp.

REFINERY PUMPS AND DRIVES
Cost Indexes of Pumps and Electrical Equipment (1946 = 100)[1]

	Pumps and air compressors	Forgings	Electrical motors and generators	Wages, electricians*	Refinery construction labor	Nelson construction index[1]
1946	100	100	100	100	100	100.0
1947	119	121	110		113	117.0
1948	127	130	129	124	128	132.5
1949	136	140	129	135	137	139.7
1950	138	151	135	138	144	146.2
1951	156	167	156	149	152	157.2
1952	156	179	155	157	163	163.6
1953	162	189	157	164	174	173.5
1954	166	196	158	168	183	179.8
1955	177	209	157	173	193	184.2

*Bureau of Labor Statistics, U. S. Department of Labor.

Contemplated here are enclosed impeller pumps with cast-iron cases, steel shafts, and bronze-impeller and wear rings. Extra costs for other materials or fittings are indicated in Table 1 and the extra cost of explosionproof motors or noncondensing turbine drives is indicated in Table 2.

The cost of installing pumps is usually only 2-4 per cent of the pump and driver cost, or for very large installations $68 per ton. However, the cost of a proportional part of the electrical service lines and the foundation for centrifugal pumps usually amounts to 20-30 per cent of the installed equipment cost.

References

1. Nelson, W. L., previous Cost-imating and Construction Indexes, and personal files.
2. Chilton, C. H., Chem. Engineering, June 1949, p. 97.
3. Aries & Newton, Chemical Engineering Cost Estimation, Chemonomics, Inc., 1951.

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The new HOUDRY ISO-PLUS Process combines the proved advantages of catalytic HOUDRIFORMING with other processes to economically reform low-octane naphthas into gasolines with octane ratings in excess of 100-octane F-1 clear. This catalytic reforming process offers refiners practical approaches to higher octanes at relatively low investment.

High-Octane Alternatives with ISO-PLUS HOUDRIFORMING

ISO-PLUS Aromatics Extraction Combinations

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2. Iso-Plus Houdriforming with recycling of paraffinic raffinate

Variations of the Iso-Plus Process employing aromatics extraction have produced yields of 100-octane gasoline, F-1 clear, of up to 91% of naphtha charge. Slight changes in operation permit refiners to further increase gasoline product octane.

ISO-PLUS Thermal Processing

3. Iso-Plus Houdriforming with thermal reforming of Houdriformate

With thermal reforming as the supplementary process, Iso-Plus processing yields 80% to 90% of reformed gasoline, depending upon the desired octane rating of the final product. This operating scheme is especially attractive to refiners with available thermal reforming equipment.

For further information, write to Houdry Process Corporation, 1528 Walnut Street, Philadelphia 2, Pa.

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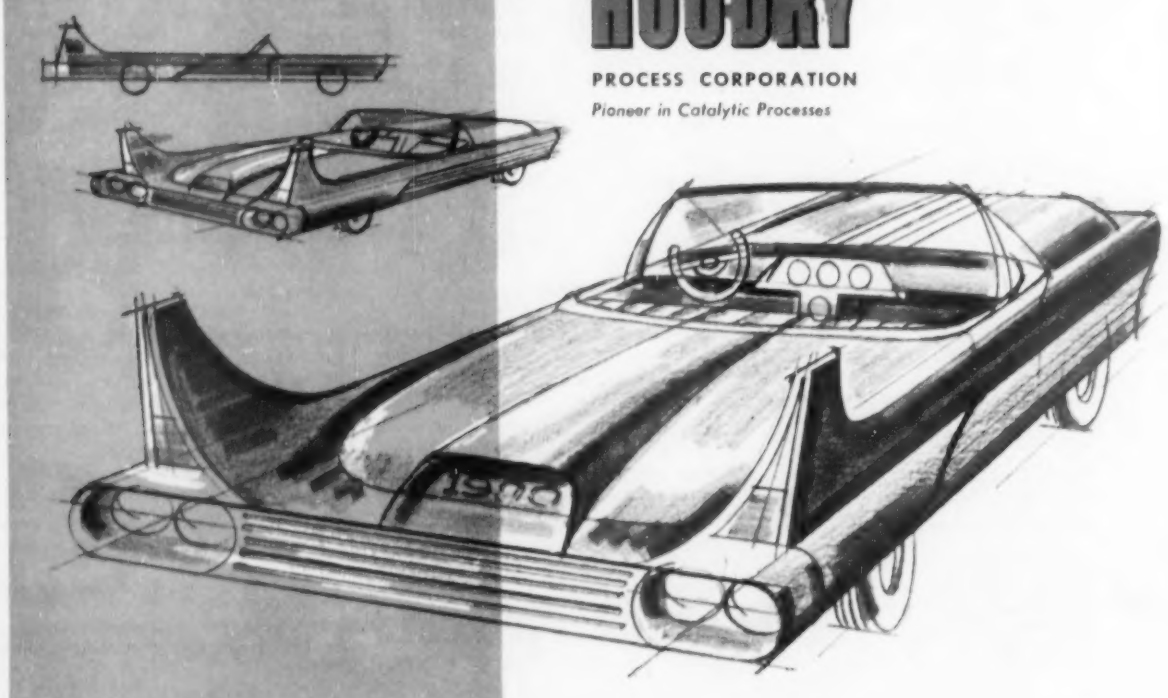


How to Prepare Metal for Painting

by J. O. Jackson* and Joseph Bigos†

IT is imperative that rust be removed down to sound metal before painting. If primers with good wetting power are used, it is possible to paint over the slight residues of rust that are almost impossible to remove by methods short of blast cleaning or pickling. These are without exception, slow drying primers.

Weathering of steel to remove mill scale should be followed by sandblasting. This procedure—covered by S.S.P.S. Surface Preparation Specification No. 9—results in good surface preparation at moderate cost. Weathering followed by wire brushing leaves considerable rust on the steel and the Steel Structure Painting Council considers this a poor method of surface preparation. It can be tolerated only in very mild climates or when removal of mill scale is imperative and better methods are impossible.

The anchor pattern produced by the surface preparation must be conducive to good paint adhesion and bonding. Solvent cleaning, improperly done, may leave a residue of oil and grease in a thin film over the entire surface interposing a nonpolar layer between the polar metal surface and the paint, thereby decreasing the attractive force between the paint and the surface.

If the film is thick, there may be a complete lack of paint adhesion. Also, excessive power wire brushing may burnish the surface, particularly in the case of mill scale, to the point that paint cannot properly adhere to the surface. Power tools, such as rotary descalers, chipping hammers, and scalers, may leave sharp ridges in the metal surface which cannot be adequately coated with paint. This same danger exists when blast cleaning with large abrasives.

*Pittsburgh-Des Moines Steel Co., Pittsburgh. †Senior Fellow, Mellon Institute of Industrial Research. Paper presented at A.P.I. Refinery Division meeting, Montreal, 1956.

Pickling operations may leave residues of hydrochloric or sulfuric acid on the metal surface unless properly rinsed and passivated. These residues of free acid will react with the metal to form sulfates and chlorides, and the residual salts are strong stimulators of corrosion. Human sweat is another strong stimulator of corrosion, and hand prints on clean metal surfaces may cause localized paint failure and corrosion.

Pretreatments . . . Closely coupled with surface preparation are pretreatments which are used to further reduce the possibility of paint failure. Cold-phosphate and hot-phosphate treatments are used to convert clean, rust and scale-free steel surfaces to insoluble, crystalline layers of iron and zinc phosphate. The resulting phosphate has an increased corrosion resistance because of its relative inertness and high electrical resistance.

These crystalline-surface conversion coatings also improve paint performance by forming a good surface anchor for the coating; because the surface is uniform, local corrosion through dissimilar surface conditions is minimized.

Galvanized iron and steel show frequent paint failure. This failure is due to poor adhesion of paint. Although a host of nostrums and home cures have been advanced as pretreatments for galvanizing, practically none of these have merit and many of them are dangerous inasmuch as they cause destruction of the zinc. The phosphate pretreatments convert the surface of galvanizing to a satisfactory paint anchor.

Wash-primer pretreatment is another effective method of improving adhesion of paint to galvanized metal. The only conventional paints which have shown merit in painting over new galvanized metal without pretreatment are the zinc-dust pigmented primers. If pretreatment is not feasible and the zinc-dust primers are not used, galvanizing must be weathered for periods of at least 6 months prior to painting.

The wash-primer pretreatment improves adhesion of paint to metal and improves the performance of paint. It should be applied over scale and rust-free metal.

Again, as in the case of blast cleaning or pickling, the advantage to be obtained in the use of these pretreatments must be weighed against the increase in cost. For mild atmospheric exposure conditions where ordinary cleaning and painting methods have proved feasible, it is difficult to economically justify the increased expense of pretreatment.

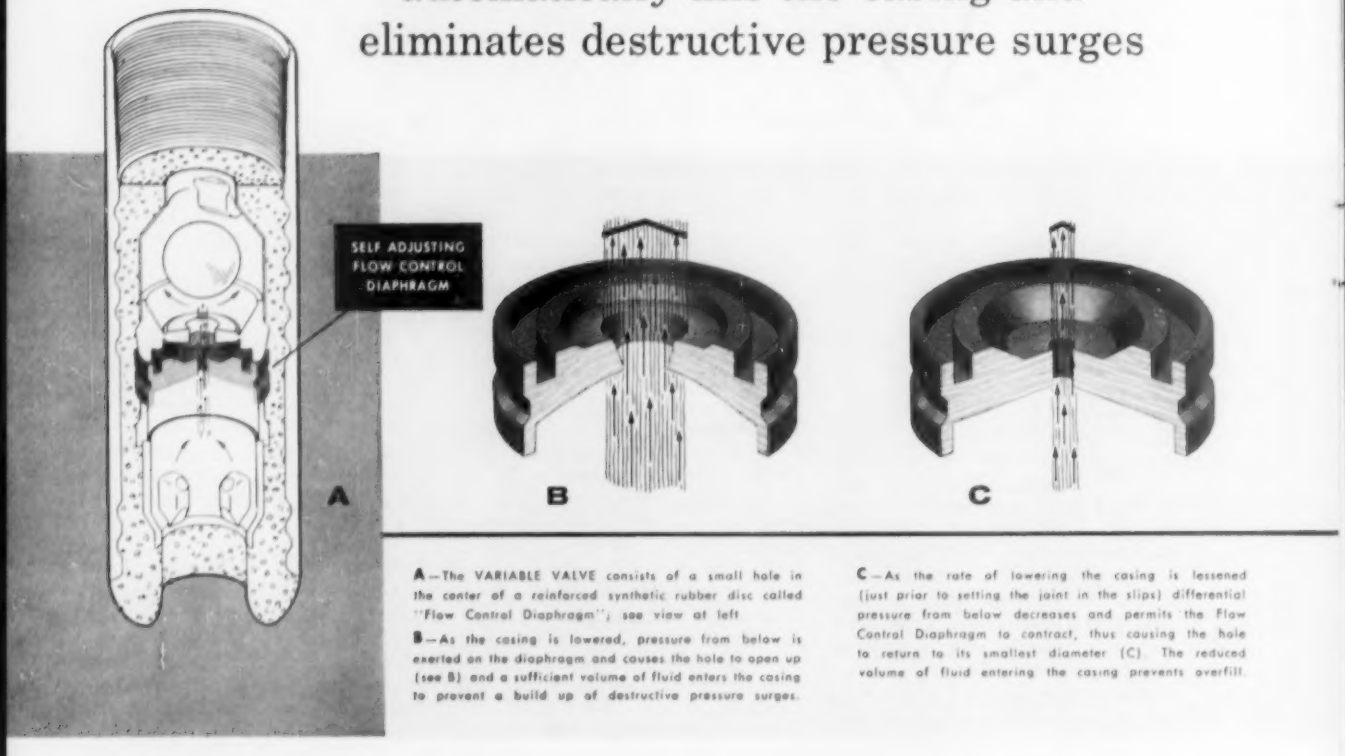
Remove scale . . . Badly cracked and broken mill scale should be removed prior to painting. In the event this is impossible, a wetting-oil pretreatment is advantageous. The improvement obtained by using a penetrating (wetting) oil preparation prior to painting is believed to result from the saturation of the surface and the sealing of cracks in the mill scale, thus preventing rusting.

Without such pretreatment, paint does not have sufficient reserve of oil to saturate rusty surfaces and still maintain the necessary balance between pigment and vehicle. Wetting-oil pretreatments are sometimes used when quick-drying primers are specified to improve adhesion of the paint to improperly cleaned surfaces.

Application of paint is second in importance to surface preparation when determining the service life to be expected of a paint system. Perhaps the most important and essential feature of good application is to obtain adequate film thickness. Improper thinning of paint makes it difficult, if not impossible, to obtain adequate thickness because thinning decreases the viscosity, makes the paint easier to apply, and increases coverage—for these reasons, frequently there is detrimental overthinning of paint.

See for yourself...

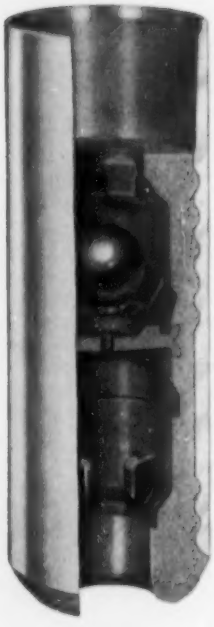
how the variable valve in FLEXIFLOW Shoes and Collars automatically fills the casing and eliminates destructive pressure surges



A—The VARIABLE VALVE consists of a small hole in the center of a reinforced synthetic rubber disc called "Flow Control Diaphragm"; see view at left.

B—As the casing is lowered, pressure from below is exerted on the diaphragm and causes the hole to open up (see B) and a sufficient volume of fluid enters the casing to prevent a build up of destructive pressure surges.

C—As the rate of lowering the casing is lessened (just prior to setting the joint in the slips) differential pressure from below decreases and permits the Flow Control Diaphragm to contract, thus causing the hole to return to its smallest diameter (C). The reduced volume of fluid entering the casing prevents overfill.



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When casing equipped with FLEXIFLOW Shoes or Collars is lowered in the well, increase in pressure from below causes the variable valve to open up wider to relieve pressure from below by permitting a large volume of fluid to enter the casing. When downward movement of the casing is slowed down, pressure from below is reduced and the hole in the diaphragm contracts to restrict the fluid entry and prevent overfilling. This action of the variable valve in opening wider and closing down, synchronizes the rate of fill of the casing with the rate of lowering the casing, *and in so doing provides maximum relief from pressure surges.*

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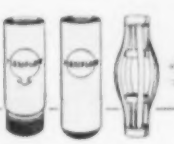


BAKER FLEXIFLOW

INDUSTRIAL POWER CYCLES FOR OIL INDUSTRY USE—7

How Two Turbines Compare in Output

by Stephen Bencze

IN Fig. 10 performance of a typical single automatic-extraction, condensing turbine is illustrated. Turbine output is expressed in per cent of rated capacity and steam flow is expressed in per cent of full-load flow without extraction. The line marked "zero extraction" shows the throttle flow which passes through the complete turbine when no steam is extracted.

There are two limits: (1) maximum load; and (2) maximum throttle flow which is represented by a horizontal line through the point of maximum power output plus the required maximum extraction at maximum power output. The sloping lines give the total flow at various outputs and with various rates of extraction flow. At constant output, the throttle flow increases as the per cent of extraction increases. As output is reduced while keeping constant extraction flow, a point is reached at which all of the throttle flow passes out as extraction flow except a very small quantity which passes through the remainder of the turbine, to the condenser, as cooling steam.

Author is with DeLaval Steam Turbine Co.

Decrease flow . . . Any further reduction of load will decrease the extraction flow at the required extraction pressure. This limit is shown as maximum extraction or minimum flow to exhaust. When steam is extracted from the turbine while carrying a given load, the throttle flow must increase but the increase is not equal to the amount extracted.

This can be seen by examining the various per cent extraction flow curves. The ratio of increase of throttle flow over that required for zero extraction to the amount of steam extracted is nearly constant for any one given turbine and set of steam conditions, however this ratio varies with turbine design, steam conditions, and extraction pressure.

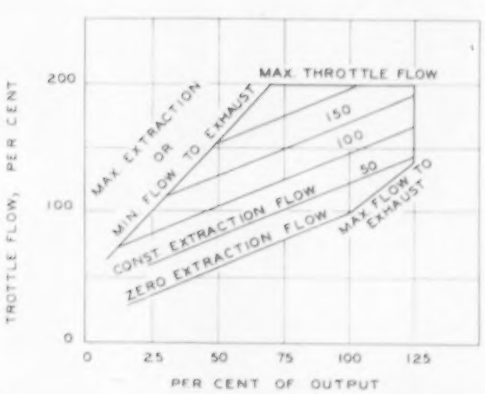
Thus Fig. 10 should be considered as typical for a single-turbine design and steam conditions. Similar performance diagrams may be constructed applying to double automatic condensing, and single or double automatic noncondensing turbines as well as mixed-flow or induction machines. For an induction unit the lines of constant induction flow would be located below and parallel to the line of zero induction flow. Fig. 11 shows such a diagram for a typical mixed-pressure turbine.

Noncondensing-Extraction Cycle

The automatic extraction, noncondensing cycle is perhaps the most versatile and widely used industrial power cycle. This cycle differs from the automatic extraction-condensing cycle described above, only in that the exhaust steam from the turbine does not go to a condenser but is used for driving lower-pressure prime movers or is used for low-pressure industrial process.

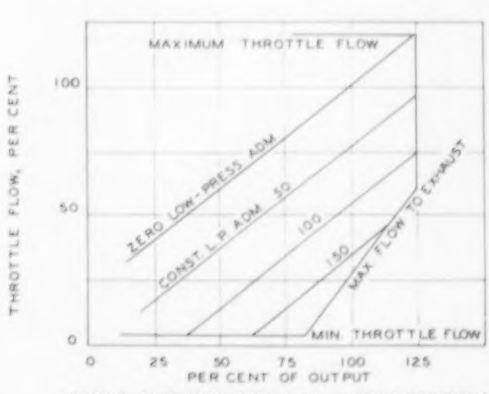
This cycle has been widely used in various chemical-process industries and in the paper industry. The versatility of this cycle is quite apparent. With the double extraction and the noncondensing exhaust, three process pressures are available.

This cycle lends itself very well to an existing system which needs expansion because of increased process and power demands, enabling the use of modern high efficiency, high pressure boilers, and turbines. In such a system the first extraction pressure would correspond to the existing system boiler pressure or high process pressure.



SINGLE AUTOMATIC EXTRACTION CONDENSING TURBINE PERFORMANCE

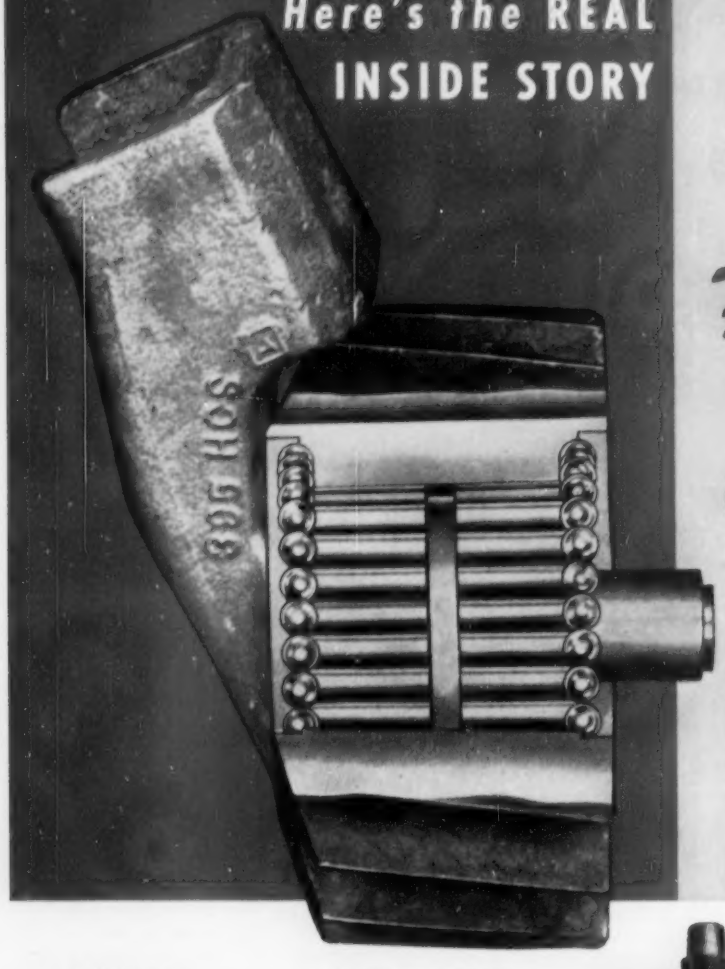
Fig. 10



SINGLE AUTOMATIC INDUCTION TURBINE PERFORMANCE

Fig. 11

Here's the REAL INSIDE STORY



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Roller Bearings on the shaft and ball thrust bearings on *both sides of the cutter* prevent tilting and wobbling of the cutters, insure true, full gage hole and trouble free running. This construction is found in no other hole opener.

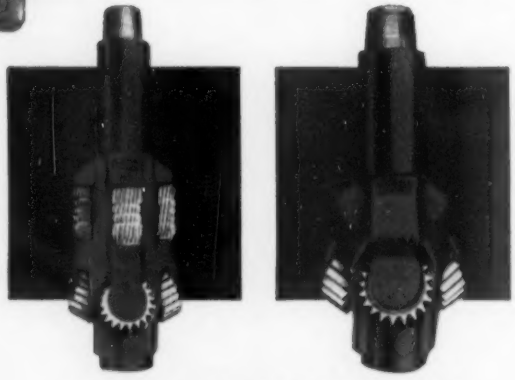
LONG NECK . . . . . is easy to catch if you have to fish.

CAST STEEL BODIES . . . Heat-treated for greatest strength.

3 REAMER CUTTERS . . . insure straight hole all the way.

CIRCULATION ON the cutters — **AHEAD** of the cutters — and through the pilot.

Supplied with **DIAMOND POINT** or **BULL NOSE PILOT,** or you can use your own dull rock bit.



Both 6-Point and 3-Point Hole Openers Available in a Full Range of Sizes

-every bit ~~as good as~~ the best!

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OIL TOOL CO.

H. C. SMITH OIL TOOL CO.

GENERAL OFFICES, EXPORT OFFICES AND PLANT: COMPTON, CALIF.
BRANCHES IN ALL PRINCIPAL OIL CENTERS IN THE UNITED STATES AND CANADA

Among the

Drilling Contractors

Canadian Contractor Joins In Six-Well Drilling Deal

Brinkerhoff Drilling Co. of Canada, Calgary, Alta., is contractor - partner with three California oil companies in a Canadian exploration program calling for the drilling of six wildcat tests.

The California companies are Sunset Oil Co., Douglas Oil Co., and Terminal Oil Co. The tests will be drilled on a farmout deal with Imperial Oil Co., Ltd., and Hudson's Bay Oil Co. involving a total of 17,208 acres between Leduc and Joseph Lake, in Alberta.

A test will be drilled on each of six separate geological structures embraced in the acreage farmout. The first test already is under way. It is located 2½ miles northeast of Heisler.

The contracting company is a subsidiary of Brinkerhoff Drilling Co., Denver.

Drilling & Exploration Co. has taken a contract for a 9,000-ft. test at Pine Prairie, in Evangeline Parish, South Louisiana. It is for L. E. Smith and L. C. Cameron at 1 Schlider-Thomas, in 26-3s-1w.

Fowler Drilling Co., Long Beach, Calif., has a new deep-drilling operation under way in the Mountain View area, southeast of Bakersfield, Kern County, southern California. It is a contract job for E. A. Bender and D. D. Dunlap at 5-19 Nichols, in 19-30-29. Plans call for a 9,200-ft. depth objective for a look at possible productive zones below the present pays in the area.

Bullard Drilling Co., Houston, has a rig working for Warren Petroleum Corp. at Anse La Butte, in St. Martin Parish, Louisiana Gulf Coast. Latest job contracted is at 3 Broussard, in 73-9s-5e, a 12,000-ft. project.

Field Drilling Co., San Antonio, is on a new wildcat job a mile south of Driscoll, in Nueces County, lower Texas Gulf Coast. It is contracted for H. C. Hargrave and W. E. Colson. Operators plan to take the hole to 8,000 ft. Location is on their Little lease in Section 108, George H. Paul Subdivision of Driscoll Ranch.

Helmerich & Payne, Inc., Tulsa, is keeping a rig working for Signal Oil & Gas Co. in the new Devonian development in the South Denton area, 12 miles east of Lovington, in eastern Lea County, New Mexico. Its newest contract is for 1 Crawford, in 5-16-38, a projected 13,500-ft. test.

Woolf & Magee, Tyler, Tex., have taken a 5,800-ft. Wilcox job in the McNair area, Jefferson County, southwestern Mississippi. Contract is with Clay Oil & Gas Corp., whose location is for 1 Krauss, in 52-8n-1e. It is a wildcat.

On the floor of a rig Fluid Power Corp., of Oklahoma City, is operating under contract for Stanolind Oil & Gas Co. in the active Short Junction field, southwest of Oklahoma City. Left to right: W. K. Wolfe, Stanolind production superintendent in the field; Roy Carroll, tool pusher for the contractor; Gleudon Carroll, driller; G. A. Williams, E. H. Mann, W. D. Stockton, and B. E. Castleberry, roughnecks.

bargain thread dope?

Is cheap thread dope really a bargain? Tool joint and drill collar thread wear can cost a lot over a year's time. Fishing jobs come plenty high. Galling or washouts mean hundreds of dollars of extra expense. 'Bestolife Lead Seal stretches thread life, cuts down on fishing jobs, galling and washouts. That's why it's the most widely used lead base thread compound in the world.

Get 'Bestolife at your supply store. In 1¼, 5, 20 and 50 lb. cans. Unconditionally guaranteed.

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L. D. 75 & 76 P. O. Drawer 36-A
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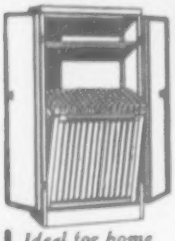

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MAP FILE
 # MT4
Metal cabinet map file with locking doors. 112 tilting tubes. Easy to file and find maps, tracings to 60".

PATENT NO. 1610368 Other Patents Pending

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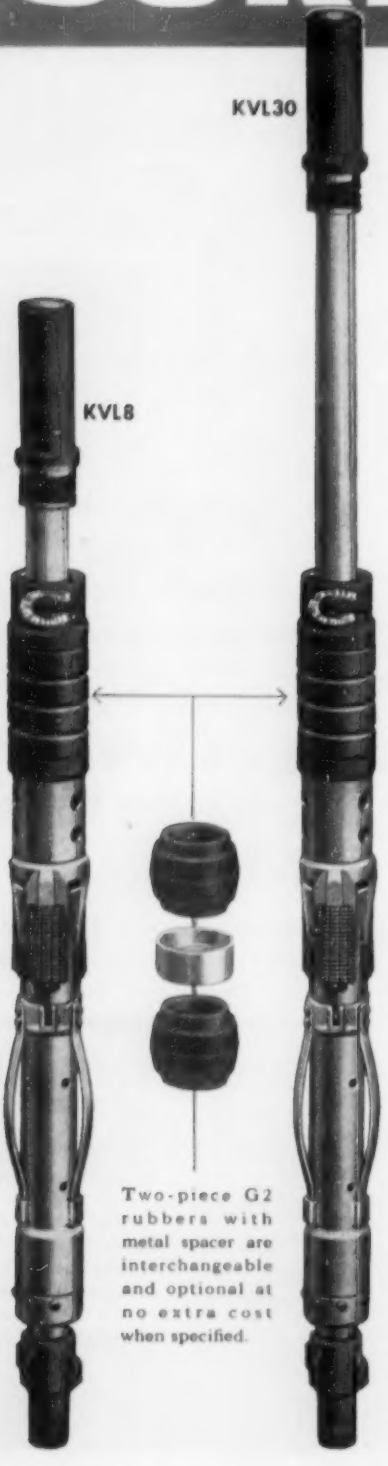
GUIBERSON'S KVL PACKERS



Two-piece G2 rubbers with metal spacer are interchangeable and optional at no extra cost when specified.

With Automatic Latch

Operators who want extra assurance that a packer won't come unlatched going in, depend on Guiberson KVL packers. Rugged and durable, KVL packers have earned a reputation for dependable performance in deep and medium depth wells. These retrievable packers are easy to set and release, with ample bypass and positive seal. When running into a liner the KVL stays latched and drag springs provide an excellent guide — features operators like. For conserving gas energy and increasing production in flowing wells; for completing wells by circulation; for acidizing, repressuring and dozens of other uses, the KVL is unsurpassed.

- Made as the KVL30 with 30″ valve stroke or KVL8 with 8″ valve stroke for standard below-packer circulation. (Both packers also made with perforated mandrel for circulation above packer.) Available in casing sizes 5″ through 9⅝″.
- Valve has two independent sealing elements, a tapered metal valve and seat and a set of oil-resistant seal rings, affording double-sealed protection.
- Rubbers made of special oil and gas resistant compound. Will not vulcanize to casing — recover original shape when released.

GUIBERSON

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CORPORATION

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Sold By Leading Oil Field Supply Stores Everywhere

Ward Quits Schafer Post To Head Own Drilling Firm

T. W. (Tommy) Ward has resigned the vice presidency of Schafer Drilling Co., Oklahoma City, to head a new drilling company with operations scheduled for the Mid-Continent area.

The new firm, Tommy Ward Drilling Co., has its executive offices at 1415 Liberty National Building, Oklahoma City.

Ward, a veteran of 25 years experience in drilling operations, has been active in every phase of the oil business, and has supervised multirig rotary work for more than 13 years.

He is succeeded in the vice presidency of Schafer Drilling Co. by John K. Norman, formerly assistant vice president.

Offshore Co., Baton Rouge, La., will drill Phillips Petroleum Co.'s new wildcat test in Block 172, Eugene Island area, 50 miles off shore in the Gulf of Mexico from St. Mary Parish, Louisiana. It will be a 6,000-ft. test at 1 Dome "B" (OCS 0471). Location is north of Phillips' Block 184 field opened last March with oil production from a 14,800-ft. sand.

Dorris Ballew, Inc., Natchez, Miss., will drill a 9,800-ft. Lower Cretaceous exploratory test 1½ miles in southeastern Lamar County, Mississippi. It is a contract job for D. A. Biglane, also of Natchez. Location is 3¾ miles southeast of Senaca, and about 1½ miles north of Pistol Ridge field, in adjoining Pearl River and Forrest counties, has been found productive in Lower Cretaceous sands off its side in recent discoveries.

Greyhound Drilling Co., Shreveport, is contractor on another Mitchell-sand well Tyler Exploration Co., Tyler, Tex., is starting in the West Bradley area, Lafayette County, southwestern Arkansas. This is the operator's second well on its Nelson lease. It is west of the initial well completed last May in the 6,000-ft. pay. Contract for the new job is for 6,500 ft.

Fletcher Drilling Co., Shreveport, contractor on Murphy Corp.'s and Sun Oil Co.'s newly completed oil-discovery well of Holt field, in Franklin County, northwestern Louisiana, is keeping its rig in that area, where it now is on a confirmation test for the same operators. The discovery well, 1-D Holt, in 28-16n-8e, 1½ miles southeast of Big Creek field, is productive from Paluxy sand at 3,880-85 ft. The confirmation test is 3-D Holt, 1,000 ft. east of the first well.

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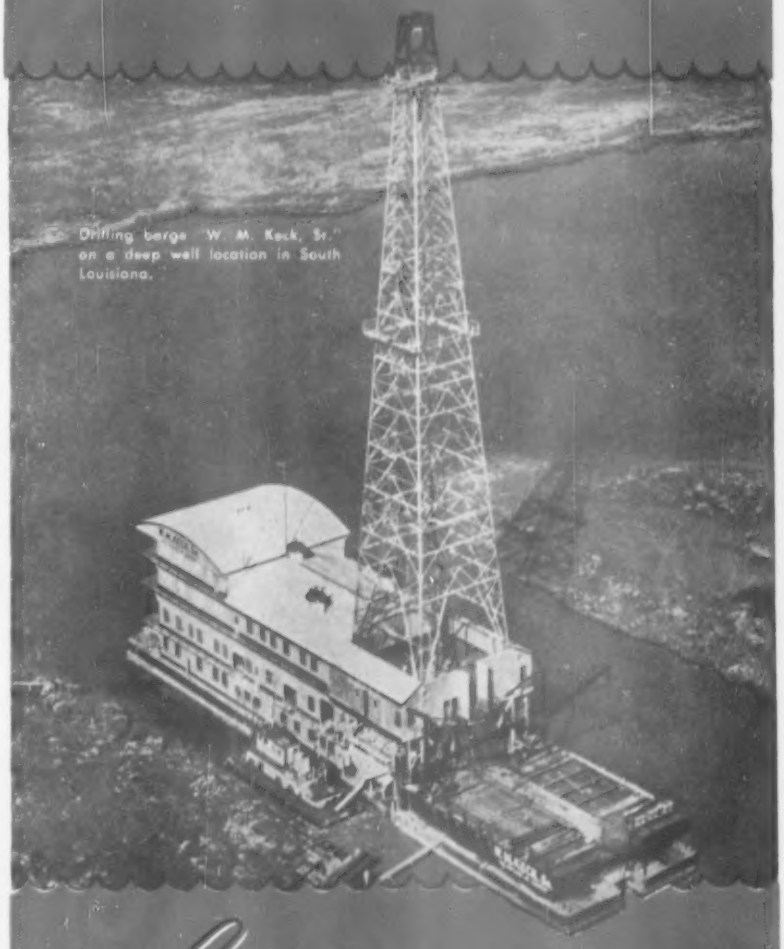

Drilling barge "W. M. Keck, Sr." on a deep well location in South Louisiana.

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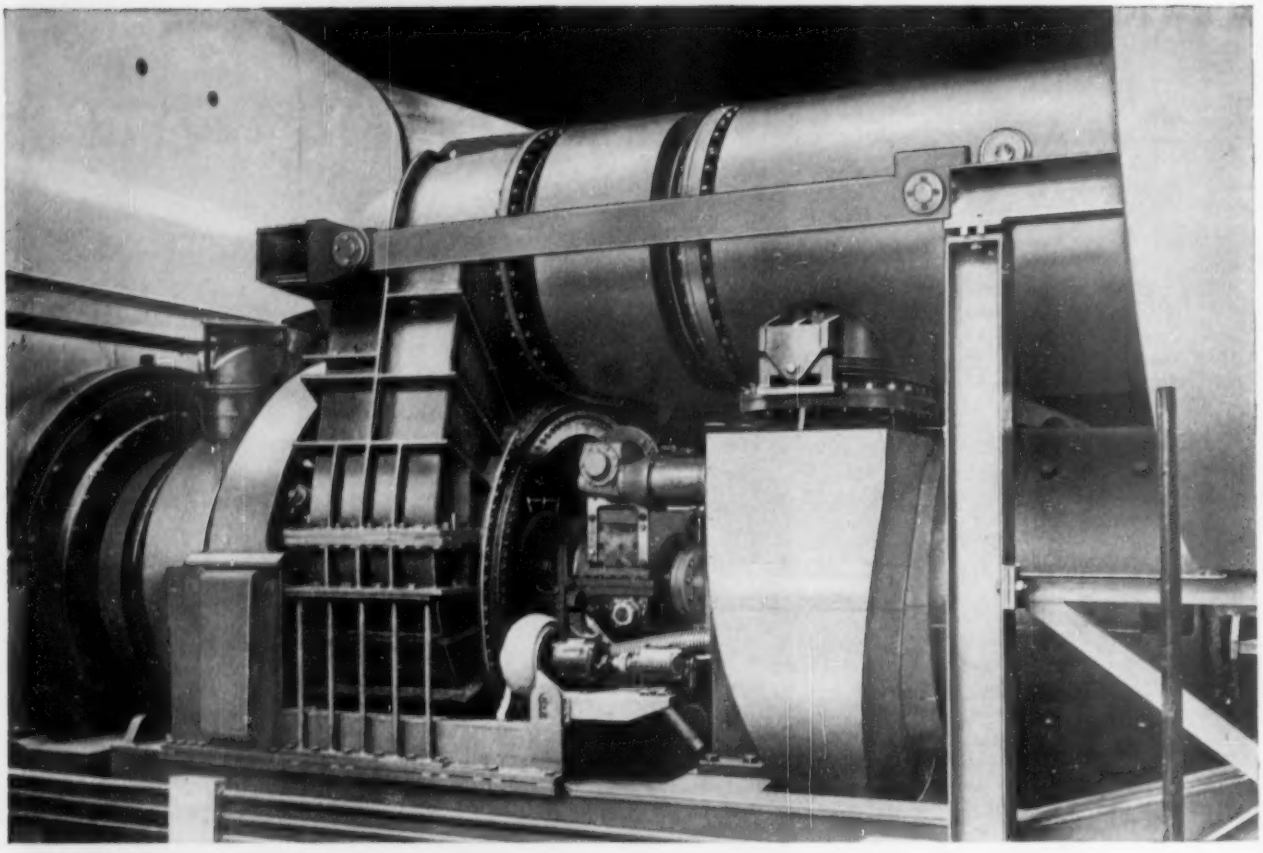
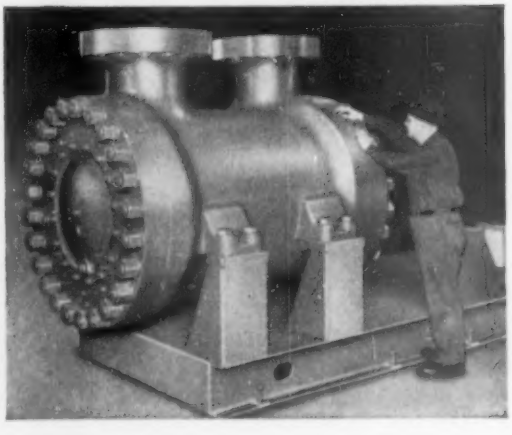


Clark 8500 BHP Gas Turbine for centrifugal compressor, generator or pump drive

Clark Barrel Type Centrifugal Compressors for extremely high pressures



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Only CLARK builds both!

Now you can get centrifugal compressors and modern gas turbines to drive them *exclusively* from one manufacturer . . . Clark.

In addition to saving money and headaches, you'll get proved, matched-performance "packages" specifically designed for continuous trouble-free service.

Whether you have a million or a billion cubic feet of air or gas per day to handle at pressures of up to 4500 pounds per square inch, there is a Clark centrifugal compressor and in most cases a matching Clark gas turbine to drive it.

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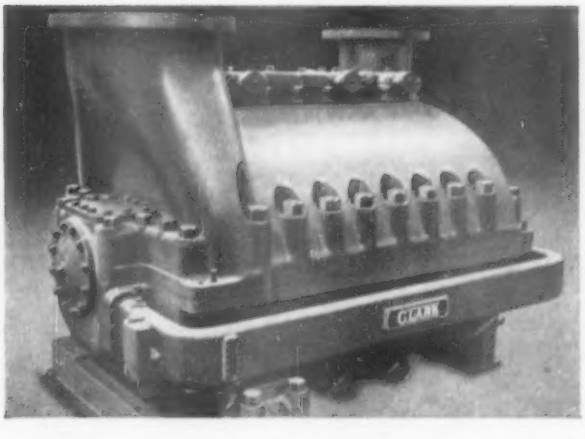
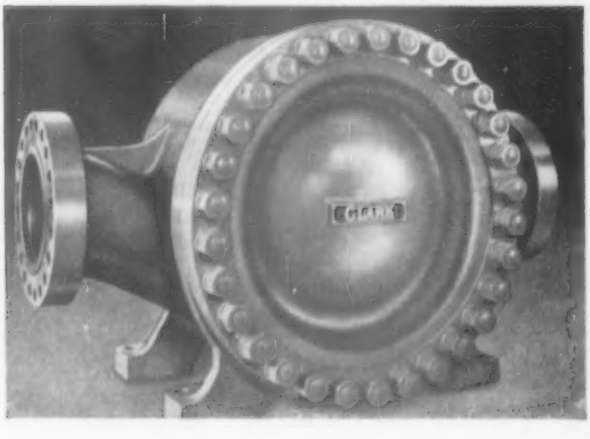
One of the Dresser Industries
Offices in Principal Cities throughout the World

Clark Multi-Stage Centrifugal Compressors for process application



Clark Centrifugal Pipeline Booster for low ratios and high pressures



CLERICAL LOAD is now reduced for this Humble gager shown stamping run ticket in presence of pumper. (Photos from Humble Pipe Line Co.)

SECOND STEP in new system is done by trained clerks in division offices who calculate barrels from gager's run ticket.

THEN "ADD-PUNCH" machine transfers data from run tickets to perforated tape.

TAPE FEEDS TELETYPE which transmits data to Houston office.

How Humble cuts gager's bookkeeping as . . .

Run tickets are processed on tape

. . . errors are eliminated in calculating

HUMBLE PIPE LINE CO. has greatly reduced clerical work done by its field gagers with a new system of handling run tickets. Now calculations of gross and net barrels are done by division-office forces instead of by the gager. Tape-punch machines and teletype plays a big part in the system.

Data from run tickets are punched on tape at division offices, teletyped to Houston, received on tape, checked, fed into a tape-to-card machine, and the cards used to feed an automatic check printer.

The net result is less clerical load on the field gager, elimination of errors in calculating runs, and a speeding up of the process of sending out oil payments.

Since the average gager would much rather move oil than keep books he's pretty happy with the plan.

The move to the new system started in July 1955 when Humble made a study of its oil accounting procedures with an eye to: (1) reduce clerical errors made on field tickets; (2) relieve gagers of increasing clerical duties; (3) speed

Announcement!

KOEHRING-PARSONS CO.

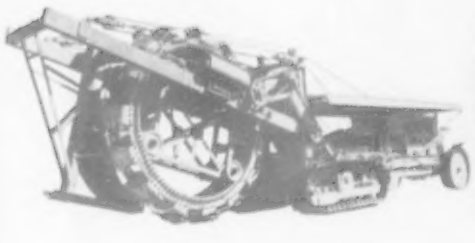
and

CRUTCHER-ROLFS-CUMMINGS, INC.

join hands to bring

Pipe Line Contractors

the world's finest manufacturing and distribution of pipe line excavating equipment



A combination for your benefit . . . the manufacturing talent of Koehring-Parsons Co. and the engineering knowhow and thorough distribution services of Crutcher-Rolfs-Cummings, Inc. Under a new arrangement, Crutcher - Rolfs - Cummings, Inc. is now the exclusive distributor in the pipeline contracting field for the Koehring-Parsons complete line of excavating, lifting and trenching equipment. Koehring has acquired the designs and manufacturing rights to the famous C-R-C Big Incher and Middle Incher ditching machines which will be built at Newton, Iowa by the Parsons Co. and sold exclusively through the C-R-C organization. C-R-C, for more than 20 years a leader in the pipeline equipment field, offers to pipeline contractors a complete line of excavating equipment. Koehring has been manufacturing construction equipment since 1906.

PARSONS CO. NEWTON, IOWA *(Koehring Subsidiary)* **KOEHRING CO.** MILWAUKEE, WIS.

DUPLICATE TAPE is punched out on receiving teletype machine in Houston.

NEXT THIS DATA is automatically transferred from tape to cards.

up information from run tickets to all departments concerned; and (4) speed up processing of oil payment checks.

The old way . . . Here basically is how they found the five divisions of Humble Pipe Line to be operating:

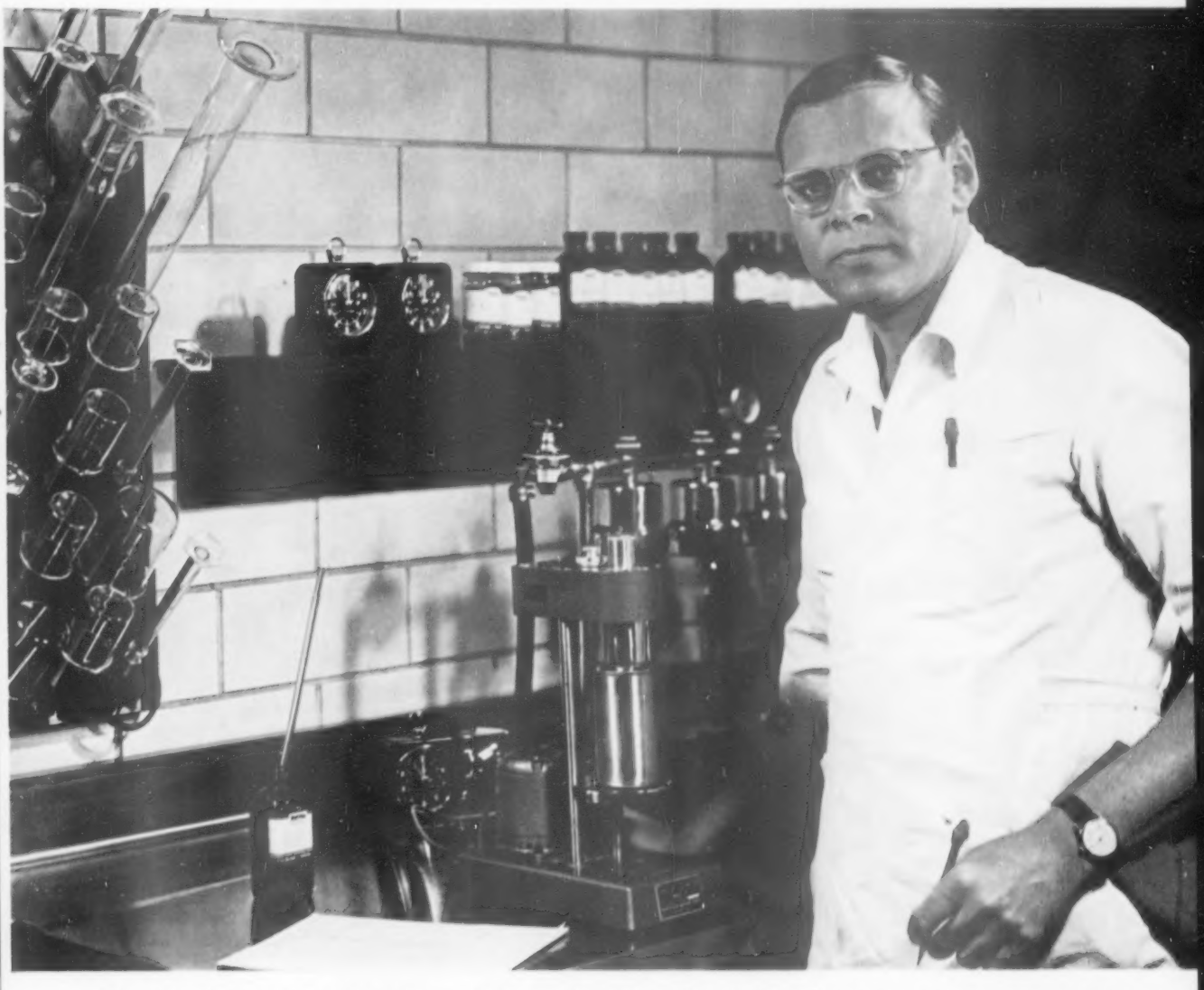
The gager, after returning from his leases where he had gaged, tested, and run oil, would fill out his run tickets (small, multicopy forms containing basic information from which payment for the oil is made). From these he would calculate the gross barrels run from tank tables furnished him by the Houston office and post the information on proration records. He then entered on a seal record the numbers of the seals he had placed on tank valves and finally mailed his run tickets to Houston where they were verified by I.B.M. equipment.

Now the new . . . Under the new system, proration records, tank tables, and seal records have been moved to the

ON 150 MILES OF 18-INCH PRODUCTS LINE between Jacksboro and Teague, Texas, this Cleveland Model 320 Trencher is showing that its speed and capacity are profitably employed on medium and small diameter jobs as well as on the big 36-inch lines. It is one of several 320's owned by the River Construction Corporation of Fort Worth. There's a Cleveland trencher that will fit the requirements of all your pipeline jobs – large and small. Talk it over with your Cleveland distributor.

THE CLEVELAND TRENCHER COMPANY, 20100 St. Clair Avenue, Cleveland 17, Ohio

It takes a complete team to keep dependable drilling mud service available for you.



Meet this Magcobar Man, typical of drilling mud research engineers who literally live with your drilling problems.

Drilling muds long ago passed the "earth and water" stage. In fact, progress has been the only constant thing. To keep ahead . . . to help solve many of your problems before they arise . . . Magcobar has reinvested a far greater percentage of its income in additional facilities and research than any other mud company.

It was in laboratories such as this, for example, where the industry's first 30 lb. gal. mud was developed, where water-in-oil emulsions were further perfected, and where Magcobar research engineers now work night and day to solve your drilling mud problems of the future. When you need mud today, look for the Magcobar Dealer sign. It is your assurance of the finest quality and the most complete service in the oil fields.

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Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION
Houston, Texas

You'll save time and trouble on H.P. VESSEL GASKETS

...when J-M Goetze gasket specialists make them for you

When you need gaskets such as those above, which were made for pressure vessel service over 5000 psi, consider this. It takes less time and trouble to turn the job over to J-M Goetze —an organization that has specialized in gasket design and manufacture for 67 years. And it usually costs less in the long run.

Goetze engineers can select the right style for maximum sealing efficiency. They know the correct metals and other factors required for efficient, long-lasting gaskets.

Goetze Gaskets are made exactly to the last detail of your specifications and conditions. They are made to craftsmen's perfection . . . with modern machine tools, some of which were specially designed by Goetze for gasket manufacture.

If you need gaskets for high pressure vessels or similar applications, send us a drawing or template for quotation. Or write for further information to Johns-Manville, Box 60, New York 16, New York.

Johns-Manville *Goetze* GASKETS

THERE'S A JOHNS-MANVILLE PACKING AND GASKET FOR EVERY SERVICE

CARDS FEED business machines which post data, automatically write checks.

pipeline division offices. The only clerical work the gager does is to fill out his run ticket and mail it to the division office. Here trained personnel make the calculations with speed and accuracy.

First the information on the run tickets is processed on an "Add-Punch" machine with a tape-cutting attachment. After checks are made to verify accuracy of the ticket the tape is fed into a teletype and sent to Houston.

Here the information is received on tape by another teletype machine and fed into a tape-to-card machine. The punched cards are placed in business machines which verify all calculations and post information to various accounts. Finally, checks are written for oil payment—all without further calculations by the clerical staff.

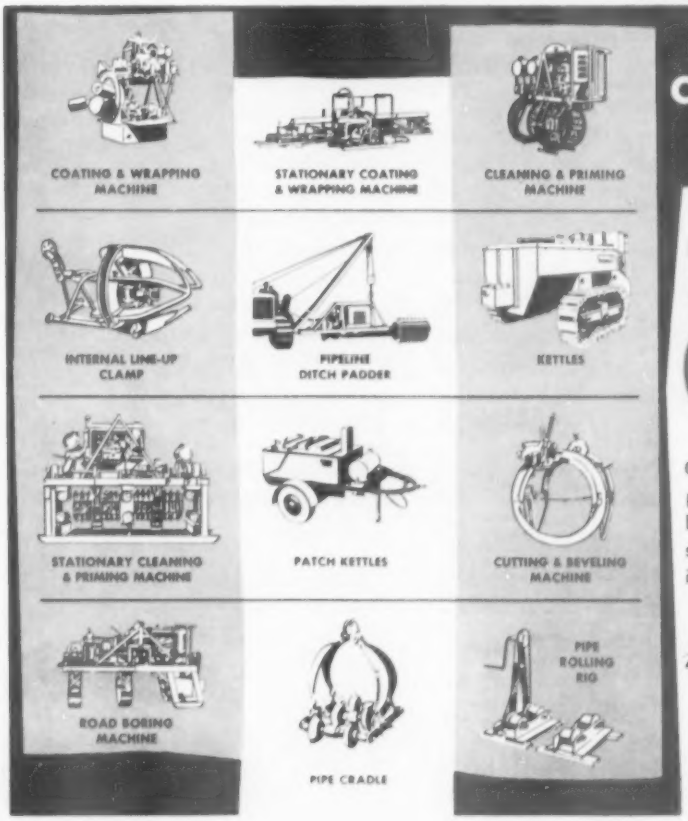
Early tests . . . The plan was first set up on an experimental basis in Humble's Refugio district of its Southwest Texas division last fall. The West Texas division began on the same basis a month later. Then came East Texas, North Texas, and finally the southern division.

Among the 40 oil gagers in the Southwest Texas division where the system is in full operation complaints about heavy booking duties have been reduced to zero. As an example of the success in eliminating errors, in January 1955, there were 160 calculation errors corrected in the Houston office for the Southwest Texas division. In March 1956, with the new system in full operation, there were no errors.

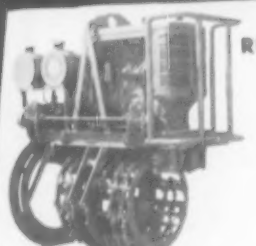
When maximum efficiency is reached it is estimated the time to process oil payment checks will be cut a full 2 days.

The system has attracted attention of other companies and several are studying the procedure for possible application to their own use.

With the system in full operation, all 269 gagers of Humble Pipe Line can abandon their adding machines, knowing that newly developed business machines and trained personnel have lifted a bookkeeping load from their shoulders.



CROSE LINE-TRAVELING CLEANING AND PRIMING MACHINE



RUGGEDLY BUILT YET LIGHT WEIGHT.

Also can be used with stationary base for yard work. Handles pipe up to 36".

Counter rotating heads assure faster cleaning and priming . . . prevent pipe from turning and give better cleaning job. These Crose machines are specifically designed for faster, trouble-free service on the line.

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BONUS FOR DRILLING CONTRACTORS

That's what your Goodall rotary hose is — a bonus for drilling contractors. Twenty years ago the Barney Coupling was developed by Goodall and today it is still the only coupling which can be re-set to make damaged hose as good as new. This means a bonus for you in that a Goodall hose when damaged can have the couplings re-set by the Goodall repair service for future use as rotary hose or in shorter lengths as vibrator hose.

The Barney Coupling, while it is probably the greatest single development in rotary hose manufacture, is only part of your bonus when you buy Goodall rotary hose. You also get the exclusive Goodall guarantee, the Goodall Safety Clamp and the Goodall repair service.

GOODALL RUBBER COMPANY

TRENTON, N. J.

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by Dan B. Miller

Cathodic Rectifier Easily Adjusts, Is Air-Cooled

The features of this service of newly designed selenium rectifiers for cathodic protection include: (1) a door that opens so it can't hit you in the back of the head in windy weather; (2) better ventilation for the rectifier stacks, no stacks are in hot spots or above other stacks; (3) parts and connections that are easily accessible for adjustment without the necessity of disconnecting cables, sliding racks, or removing panels; and (4) cable openings that are at the rear of the housing for a safer, clean looking installation.

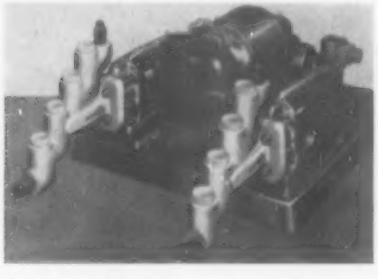
The new units come in four sizes and are air-cooled. The stacks can be connected in series, parallel, or series-parallel. Both the housing and the framework are made of heavy steel with a durable, heat-reflecting finish. **For more information write or call: Corrosion Services, Inc., P. O. Box 7343, Tulsa, Okla.**

●

Plastic Fluid End Used On Controlled Volume Pumps

Plio-Tuf is now used on controlled-volume pumps for low-pressure, moderate-temperature applications where the chemical being pumped would corrode metals and alloys. This material is a resin compound and is therefore inert to many chemicals which cannot be handled by alloys. In addition, where other chemicals can be handled by both an alloy and Plio-Tuf, the cost of the Plio-Tuf end is usually less than that of the alloy.

The relatively low cost of this new



liquid end is partly due to the fact that Plio-Tuf, which is manufactured by Goodyear Tire & Rubber Co., can be molded and does not have to be extensively machined. It can be used on pumps with plunger diameters up through 1⅛ in.

The recommended ranges of use of the new liquid ends are: pressure, 150 psi.; capacity, 70 gal. per hour; and temperature, 160° F. **For more information write or call: Milton Roy Co., 1300 East Mermaid Lane, Philadelphia 18, Pa.**

●

New Mobile-Radio Provides Vehicle, Offshore Service

A new mobile-radio system, which delivers 100 watts minimum output, extends better coverage between vehicles and provides better ties between offshore operations and the mainland. This two-way unit, designated Model MCA-105-B mobile radio system, guar-

OIL AND GAS JOURNAL Showcase Coupon

USE THIS FORM TO OBTAIN INFORMATION ON ITEM DESCRIBED HERE

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Please send me complete information on the following item

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antees 100 watts minimum output across its entire frequency band, 25 to 54 mc.

Constructed to meet severe operating conditions, exceeding R.E.T.M.A. humidity and vibration specifications, the system includes a transmitter, receiver, power supply, and all relays with a single compact housing, and a control head and microphone, speaker, antenna, power-fuse assembly, and all necessary cables. The palm microphone offers excellent audio response and high output, in addition to a front hangup button to permit ease of handling and to eliminate juggling. Easy servicing is achieved through special design which eliminates hidden and congested areas. **For more information write or call: Allen B. Du Mont Laboratories, Inc., 760 Bloomfield Avenue, Clifton, N. J.**

•

Analog to Digital Converter Offered as Basic Tool

A new eight-bit sine-cosine analog to digital converter consists of two disk-type commutators with pick-off brushes. The double-brush V-scan system is used to avoid ambiguity. The input shaft is scaled at 360° per revolution full-scale input. No intermediate gearing is necessary.

Coding is in continuous-serial binary form in increments of 2-8 for values of the functions from zero to one. A ninth bit is included to enable the encoding of the value one.

The instrument is coded such that each quadrant is divided into 257 parts, each part representing equal values of the functions. Both sine and cosine values are simultaneously available.

The converter is compactly packaged in a cylindrical housing approximately 4 in. in diameter and 3½ in. long, including the stationary portion of an electrical connector. A standard synchro-mount is provided on the input-shaft end of the unit. Weight is approximately 20 oz. **For more information write or call: Librascope, Inc., Glendale 1, Calif.**

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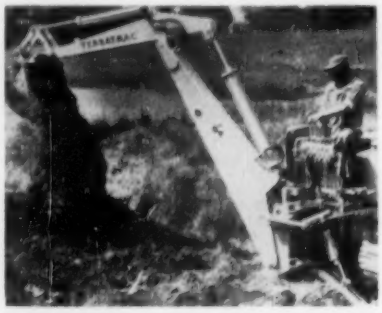

Backhoe Lifts 3,000 Lb., Digs 12½ Ft. Deep

Here's a new backhoe that is designed and built exclusively for heavy-duty use on TerraTrac crawler tractors. Featuring a minimum of gadgets and exposed hydraulic plumbing, it has a lifting capacity of 3,000 lb. The unit digs 12½ ft. deep, has a reach of 18 ft., and clear dumping height of 13 ft. for loading high trucks. A bucket rollback of 90°, controlled by an extra large hydraulic pump, insures heaped loads without spilling. Buckets from 17 to 24 in. wide are currently available.

The backhoe features a 180° boom-swing with hydraulic foot-pedal control, which speeds up cycle time and simplifies operation, because it leaves the operator's hands free to maneuver the boom and bucket while swinging. **For more information write or call: American Tractor Corp., Churubusco (Fort Wayne), Ind.**

•

Liquid-Level Gage Flashes Light to Warn of Low Water

This remote-reading liquid-level gage now has a new safety feature. The face of the gage scale lights up and flashes red continuously to warn when the liquid level is too high or too low. The gage gives a positive visual warning

which immediately signals if there is trouble in the level of the boiler water. When the liquid level is safe, the scale is illuminated with two 15-watt bulbs, one at either end. When the alarm points are reached, the whole scale is brightly lit in red by a large bulb in the center which flashes continuously until the dangerous condition is corrected.

Providing instant remote reading of liquid levels of boilers and tanks, the gage has a convex face, with scale marking directly on the face. It can be read from any point from which the face can be seen.

In addition to being easy to see and read, the gage may be equipped with signal horns, lights, and up to six repeaters so it can signal the whole operating floor as well as officials at other remote points. **For more information write or call: Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.**

•

Three Series of Diesels Offer 178, 320, 520 Hp.

This diesel engine is made in three series and designated TCD for turbo-charged diesels. The TCD-501 is a six-

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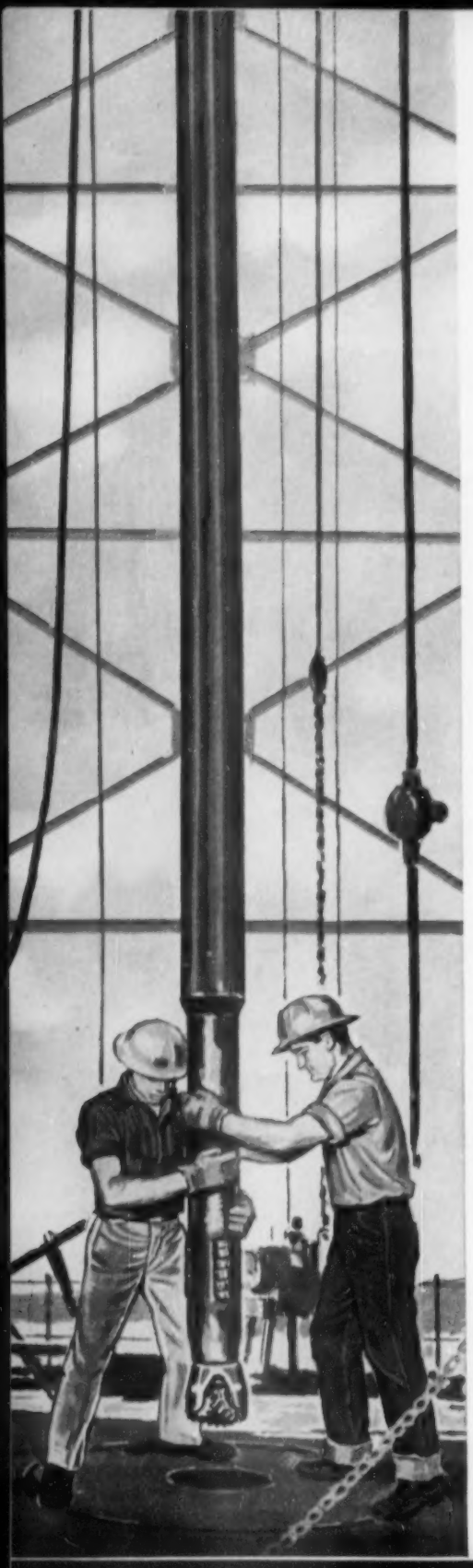


New drilling

Longer bit life . .

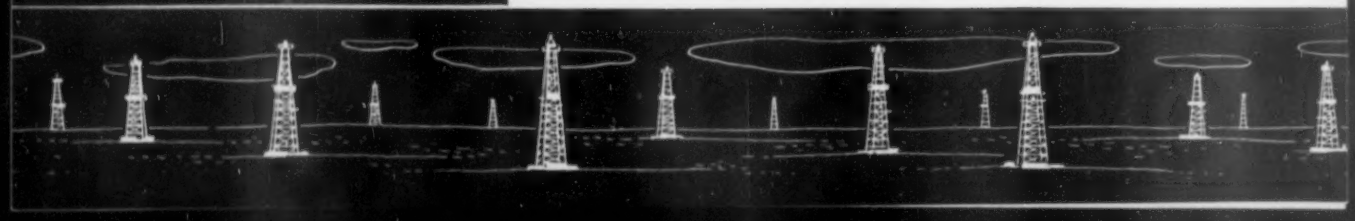
The emulsifier creates and maintains an oil film on the bearings and drill pipe, increasing bearing life, providing substantial corrosion protection, and permitting increased weight on the bit. Viscosity build-up and weight increases from shales are eliminated, as low specific gravity solids are dropped out.

Fewer bits required

In over 20 wells drilled with this emulsifier in the Permian Basin, the following observations were made:

Penetration rates and bit life were remarkably increased. An average of only 26 bits were used, as compared with 45 bits with water and water base muds. Cuttings size was improved. Torque was greatly reduced. A better and safer hole was made. Additional information and case histories are presented in The Oil and Gas Journal for Aug. 13, 1956. Read "New Oil Emulsion Speeds West Texas Drilling" by Ed McGhee.

Look for this seal ▸



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OIL AND GAS JOURNAL Showcase

.....OF NEW EQUIPMENT

cylinder model that has a 4½-in. bore by 5¼-in. stroke, produces 178 hp. at 2,000 r.p.m. and has a 48⅞-in. length fan-to-flywheel. An important feature of this model is that its turbocharger may be positioned to fit the particular application.

The TCD-895 is also a six-cylinder engine but with a 5⅝-in. bore by 6-in. stroke. It develops 320 hp. at 2,000 r.p.m. and has a 62-in. length fan-to-flywheel. Its turbocharger may also be positioned to fit the particular application.

The TCD-1468 is an eight-cylinder vee-type model and has a 6¼-in. bore by 6-in. stroke. It develops 520 hp. at 2,000 r.p.m. and is only 59⅞-in. long from fan to flywheel. Its turbocharger is located in the vee.

Communication equipment, oil-field service, and the marine industry are some of the fields utilizing this compact and dependable power. **For more information write or call: Hercules Motors Corp., Canton, Ohio.**

•

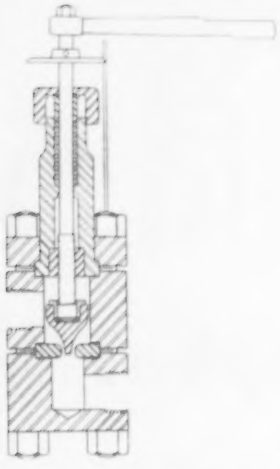
Device Drills Holes in Gas Mains Under Pressure

This new drilling device drills hole in gas mains under pressure, and only one man can set up, drill, and connect pipe to the main. The field-tested device uses a hollow mill trepanning cutting tool of the size desired. The plug cut from the gas main is caught in the cutter and is removed from the pipe. **For more information write or call: M. B. Skinner Co., 3502 West Sample Street, South Bend, Ind.**

•

Valve Built for High Temperature and Pressure

Successfully used for 15 years on hydraulic and air service up to 10,000 psig., on steam service up to 2,500 psig., and on ammonia up to 5,000 psig., Evrtyte block-steel valves are built for high temperature, high pressures, and continual throttling. They are available in either inside screw, Type SBX, or outside screw, Type SBOX.



The bolted-in seat construction eliminates screwed or welded-in seats and permits a wide range of seats and disks having a surface hardness of 70 Rockwell C. This greatly reduces the possibility of wire drawing, cutting, or scoring.

Regularly furnished with carbon-steel bodies in sizes ⅜, ½, ¾, and 1-in., the valves can also be obtained on special order in chrome moly and stainless steel, as well as in larger sizes. **For more information write or call: Strong, Carlisle & Hammond, 1392 West Third Street, Cleveland 13, Ohio.**

•

New Remote-Control System Aids Process Plants

This new remote-proportioning control system offers a high degree of flexibility in meeting remote-process supervision problems. Over one circuit, it both controls pilot-proportioning operators and continuously monitors the changes that are produced. The control system features package building-block

---

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construction which can be installed by the average plant electrician. As control requirements change or increase, units can be added without extensive modification.

Adaptable to a variety of needs, the control system is available with or without transducers for telemetering such functions as pressure, flow, water level, pH factor, power, speed, phase shift, electrical quantities. It may be used in conjunction with existing operators or can be supplied complete with reversing motors and pilot operators up to several horsepower. **For more information write or call: Sparton Control Systems Division, The Sparks-Withington Co., Jackson, Mich.**

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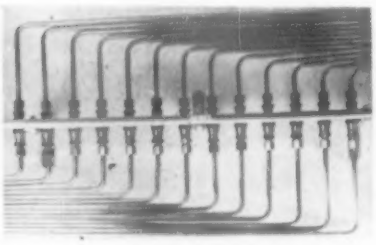

Bulkhead Bar Connects Instrument Terminals

Suitable for straight or angled tube terminal connections, this bulkhead bar is a light section of channel with ¾-in. brass couplings mounted on 1½-in. centers.

The standard bar is 5 ft. long and contains 40 couplings. Other sizes like it with 13 couplings can be obtained to customer's specifications. **For more information write or call: Instrof Corp., Division of T. J. Cope, Inc., Collegeville, Pa.**

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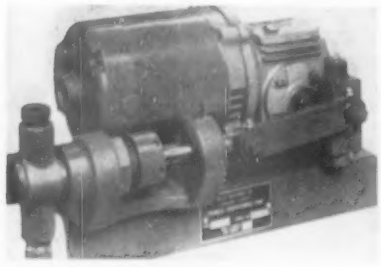

Chemical-Feed Pump Discharges at 600 Psi.

A new chemical-feed pump is compact and simplified. The Model 4411 has a maximum capacity of 7 g.p.h. per feed and discharge pressures up to 600 psi. Of the positive displacement type, the Model 4411 pump is suited for applications such as the continuous feeding of chemicals used in water conditioning, chemical-process additive feeding, and petroleum-inhibitor addition. **For more information write or call: Hills-McCanna Co., 2443 West Nelson Street, Chicago 18, Ill.**

•

Winch Kit Fits on 1956 International S-120 Truck

This new winch kit is made up of a 6,000-lb. capacity front-end winch and all necessary fittings. Designated the MU3-2, the unit is designed for use with the 1956 International S-120 4 by 4 truck.

The kit is easily assembled and installed in about 4 man-hours with ordinary tools. Neither the frame nor grill has to be cut. The only cutting necessary is the opening in the front of the bumper to permit spooling of the cable.

The unit is designed to fit the Warner T-9, special transmission, left-hand opening. Either flexible or lever controls are available. **For more information write or call: Braden Winch Co., P. O. Box 547, Broken Arrow, Okla.**

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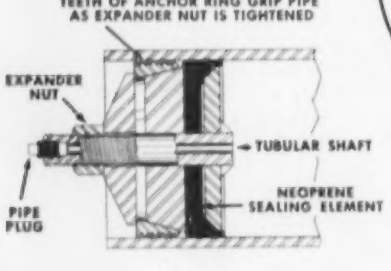
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OIL AND GAS JOURNAL

Showcase

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Forged-Steel Fittings Catalog. A new 28-page catalog on forged-steel pipe fittings contains dimensional, engineering, and application data on forged screw-end and socket-welding fittings for high-pressure service. Bulletin A-3-56 features simplified charts and useful data on forged-steel unions, reducer inserts, welding bosses and special fittings. The engineering-data section contains helpful information on materials selection, pressure ratings, pipe thread and socket-welding specifications, and useful hydraulic and mathematical tables. **For more information write or call: W-S Fittings Division, H. K. Porter Co., Inc., P. O. Box 95, Roselle, N. J.**

•

John Crane Teflon Products. This new 12-page, 3-color brochure gives information on products fabricated from Teflon and many applications for which it can be fabricated. Called Form T-110, the brochure includes data on (1) properties, (2) a complete specification table, (3) descriptions of fabricated products, together with operational and service data. All being made from Teflon, the products Form T-110 describes include (1) mechanical and hydraulic packings, (2) freeflow envelope-type and solid gaskets, (3) O rings, (4) flexible bellows, (5) sheet, rod, tubing and tape, (6) molded and machined parts for mechanical equipment used in chemical, refinery and severe thermal service, and (7) electrical and electronic parts and insulation. **For more information write or call: Crane Packing Co., 6400 Oakton Street, Morton Grove, Ill.**

•

Petrocarbon Developments Limited. This four-page folder tells of an English company's services of engineering and consulting for the petroleum and chemical industries. Presenting photographs of installations designed, engineered and erected by this firm, the two-color folder explains the aims and describes the facilities of the company. **For more information write or call: E. H. Sullivan, The D. Brook-Hart Co., Premier House, 48 Dover Street, London W 1, England.**

Standard Meter Runs. Bulletin P-100 gives detailed dimensions, is completely descriptive, and lists specifications which should be included with an order. The company makes complete meter stations with valves, regulators, and gas scrubbers. Company engineers are constantly on call to calculate orifice bores or flow coefficients. Standard meter runs are fabricated from select seamless meter tubing or pipe, with tolerances closer than A.G.A. requirements. **For more information write or call: Maintenance Mechanical Corp., P. O. Box 2637, Houston 20, Tex.**

●

Single-Phase Motors, a new bulletin, features new 10 and 15 hp. all-weather, high torque, capacitor-start, capacitor-run single-phase motors. The two-color, four-page bulletin describes the new motors' features, which include complete protection against weather, debris, and small field animals. The motors are available in 1,725 and 1,140 r.p.m. speeds. **For more information write or call: Robbins & Myers, Inc., Motor Division, Springfield, Ohio.**

●

Industrial Tractors and Equipment. A 24-page booklet uses application photographs and specification tables to describe medium and light-duty industrial tractors. The No. 420 crawler tractor is featured in Booklet A954-56-2 with description of its two-cylinder engine. The No. 61 angling dozer for the No. 420 tractor is also shown and specifications given. Other smaller tractors with special equipment are depicted with specifications, and owner testimonials. **For more information write or call: John Deere, Industrial Division, Moline, Ill.**

●

Oil and Gas-Well Stimulation Services. This new, 20-page catalog, describing oil and gas-well stimulation services, includes descriptive data and information on acidizing and fracturing services, Permeter survey services, and auxiliary services such as emulsion and water block removal treatments. **For more information write or call: The Chemical Process Co., P. O. Box 831, Breckenridge, Tex.**

●

Heating Cable. Describing three types of cable, Bulletin 19-675 contains product, application, and installation information and collateral data to help in the selection and installation of heating cable for any specific job. Including typical applications of heating cable, the publication shows diagrams illus-

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Hydrepair® Asbestos Cement Pipe Clamp

Style 63 Expansion Joint

Style 39 Insulating Coupling

trating the proper methods of installing heating cable for various applications as well as specific heats and other data on gases and vapors, liquids, and solids. Conversion tables are also given. **For more information write or call: General Electric Co., Construction Materials Division, Bridgeport, Conn.**

•

Nickel and Nickel Alloy Tubing. Containing 20 2-color pages, Catalog 12 features handbook information on nickel and nickel alloy for use by designers, production engineers, and purchasing executives. Tabulated for reference, the catalog contains a list of specific mechanical properties and chemical compositions of 13 analyses of tubing. A section on the selection and application of tubing describes characteristics of each analysis and illustrates typical applications with both line drawings and photographs. **For more information write or call: Superior Tube Co., 1764 Germantown Avenue, Norristown, Pa.**

•

Process-Monitor Mass Spectrometers. Containing 15 2-color pages, Bulletin 1824B explains the use of mass spectrometers for continuous or individual sample analysis. Setting forth details of the instruments, the booklet furnishes (1) process-stream diagrams, (2) schematic drawings, (3) performance characteristics in table and graph form, and (4) a list of accessories. **For more information write or call: Consolidated Electrodynamics Corp., 300 North Sierra Madre Villa, Pasadena, Calif.**

•

Petroleum Gaging Equipment. Listing all types of centrifuges, this new catalog describes equipment used in gaging petroleum products in all phases of the oil industry. Using photographs, this catalog includes information on (1) sample bottles, (2) hydrometers, (3) gager's tape, (4) mailing cases, and (5) plumb bobs. The publication also contains a description of (1) centrifuge parts and accessories, (2 oil thieves and parts, and (3) tank thermometers. **For more information write or call: W. H. Curtin & Co., 4220 Jefferson, Houston, Tex.**

•

Electric-Motor Bulletin. Describing a line of electric motors, four-color Bulletin 1878 illustrates open-type Uniclosed designs, totally enclosed and explosionproof types, Varidrives, Syncrogears, and right-angle worm gear models. The bulletin also describes vertical and Verticlosed hollowshaft motors. **For more information write or call: U. S. Electrical Motors, Inc., Box 2058, Los Angeles 54, Calif.**

EQUIPMENT MEN . . . in the News

Davison Names Goodall to Petroleum Catalysts Group

R. D. GOODALL

R. D. Goodall has been advanced to general manager of the petroleum-catalysts group by Davison Chemical Co., division of W. R. Grace & Co. He was formerly assistant vice president in marketing. A. R. Worrall, formerly manager of Davison's Curtis Bay works, heads industrial chemicals, and D. P. Barrett, formerly sales manager of industrial chemicals, is in charge of rare earths.

Under Goodall, Page Edmunds II continues as sales manager for petroleum catalysts; W. R. Fullem is production manager. Worrall has L. C. Reid, formerly assistant sales manager for industrial chemicals, as sales manager, and A. W. Hemphill as production manager. Assisting Barrett are R. L. Stone on sales and Richard M. Mandle on production. Both are vice presidents of Davison's affiliate, Rare Earths, Inc.

Fischer and Biben Appointed by RCA

Abraham Fischer has been named sales and merchandising manager, technical products service department, RCA Service Co., Inc., according to W. L. Jones, vice president, technical products service department. He also announced the appointment of Benjamin F. Biben as theater service sales manager, technical products service department.

Fischer, who has been with Radio Corp. of America 25 years, was sales manager of mobile equipment, consumer products service department, prior to assuming his new post. Biben started with the company in 1929 in theater service. He had been serving as manager technical field service, Philadelphia district, prior to his new appointment.

Guests Attend Recent Meeting of Houston Nomads

Guests attending a recent meeting of the Houston chapter of Nomads included: (seated) Alfonso Ramos, Hughes Tool Co. of Mexico; A. P. Berry, Socony-Mobil Oil Co.; Ray Myers, Continental Supply Co.; Dr. Don Chapman, Houston; and W. D. Stine, Texas Gulf Sulphur.

Standing are: C. U. Posgate, Shell Oil Co.; John Weber, Houston Technical Laboratories; D. M. Brock, Garrett Tools; R. E. Irby, Socony-Mobil Oil Co.; John Munro, Applied Power Equipment; R. D. Walker, S & R Tool Co.; S. D. Sands, Union Oil; C. W. Sternberg, Heidelberg Sales Co.; Frank Keightley, Asiatic Petroleum Co.; and Rein Escher, Compana Shell De Venezuela.

Beaird Promotes McRoberts To Staff Consultant

E. S. McRoberts, who has been manager of compressor sales for the past 10 years, has been promoted to staff consultant of the general sales department of The J. B. Beaird Co., Inc., J. L. Tullis, vice president and general manager of sales, has announced.

E. S. McROBERTS

W. W. SENTELL

In assuming his new post, McRoberts will be succeeded as manager of compressor sales by W. W. Sentell, promoted from assistant manager.

J. B. Beaird Sales Representatives Hold Annual Meet

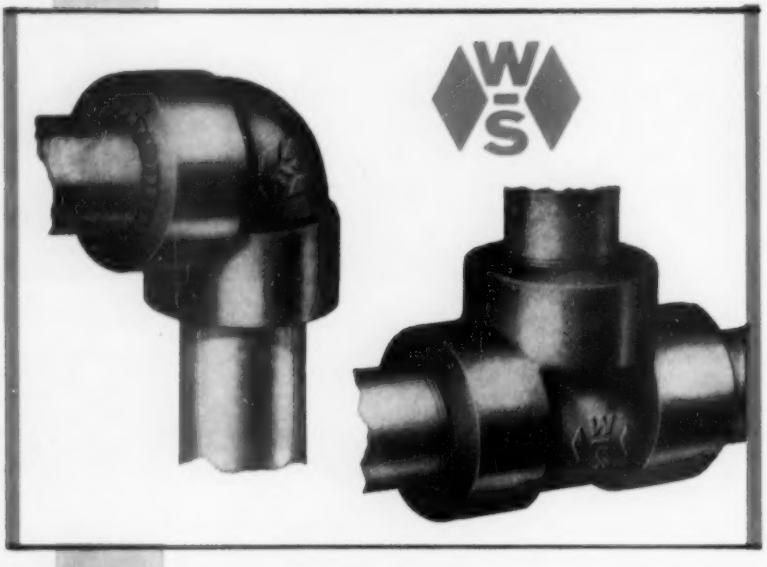
Sales representatives of The J. B. Beaird Co., Inc., converged on the general offices in Shreveport for their annual meeting. Designed as both a training session and progress report, the agenda included discussions of new-product designs and development, the Beaird profit plan of financing, the company's new Midwest plant in Clinton, Iowa, advantages of the new stress-relieving oven being built at the Shreveport plant, expanded operating territories, and merchandising plans for the coming year. Among the group above are representatives from all five Beaird sales divisions: LP-Gas and anhydrous ammonia equipment, compressor and plant storage, machine products, special products and steel warehouse.

National Opens Cortez Store, Names Manager

The National Supply Co. has opened an oil-field-supply store at Cortez, Colo. E. I. Ayala has been named manager of the store. It is under the supervision of Luther M. Miller, district manager of the Colorado district.

The Cortez store will serve oil operators in southwestern Colorado and

2 Safe Ways to PROTECT Pressure Piping...



W-S SCREW-END and SOCKET-WELDING FORGED STEEL FITTINGS

Pipe joints are potential trouble spots in high pressure piping systems. Change in direction of flow causes turbulence, erosion and vibration. Watson-Stillman fittings are made to absorb this type of punishment. They're drop-forged for strength and toughness and safety-factor designed for the protection of your piping.

Choose between a welded piping system and a screwed one to suit your needs. Then choose W-S Screw-End or Socket-Welding Fittings to join your pipe. They're available in sizes ⅛" to 4" for piping up to 6000 lb. W.O.G. class. For high temperature or corrosive service you can get W-S Forged Stainless and Alloy Steel Fittings, too. Send today for our informative catalogs.

W-S FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

Roselle, New Jersey

southeastern Utah. Part of this area was formerly served by the company's store at Farmington, N. M.

Alco Names Southwest Sales Representative

The appointment of William L. Wilcox, W. W. Power, and William O. Rogers as sales representatives in the Southwest have been announced by Alco Products, Inc. Wilcox will make his headquarters in Alco's Houston office, Power will be located at Lafayette, La., and Rogers will work from Odessa, Tex.

Wilcox previously worked for Cameron Iron Works, Rector Well Equipment Co., and Oil Center Tool Co. Power has worked in the oil industry for the past 19 years in both drilling and production capacities. His career, which includes sales and service work, has included service with The Texas Co., Texas Iron Works, Inc., Johnston Testers, Inc., and Axelson Manufacturing Co.

Rogers has been with Drilling & Service, Inc., in 1953 was manager of Texas Warehouse Co. of Odessa, and in 1954 joined Texas Iron Works as a sales and service engineer, remaining there until his new appointment.

Badger Adds Ackerman to New York Sales Staff

A. W. Ackerman has joined the New York sales office staff of Badger Manufacturing Co. of Cambridge, Mass. He will represent the company in the areas of engineering, procurement, and construction services to the petroleum, petrochemical, and chemical industries. Prior to joining Badger, Ackerman was in the New York contract sales department of Lummus Co.

Beeson Wins at Nomad's Annual Whing-Ding

Lefty Beeson of Specialty Sales Co. (right) receives the president's trophy for Nomad low gross from Harry Hester of McCullough Tool Co., president of the Los Angeles chapter of Nomads, in the golf turnament at the annual whing-ding of the Los Angeles Nomads.

Morris and Ray Are Sales Appointees for Nickles

H. A. MORRIS

H. A. (Bob) Morris has been promoted to the position of sales manager of Nickles Machine Corp., Ponca City, Okla. Morris, who joined Nimco in 1954, has had many years' experience in the industrial-engine maintenance field.

Morris is succeeded as Permian basin representative and sales manager for Nimco by Jack M. Ray, who joined the company as salesman last year. Ray will make his headquarters in Odessa, Tex.

Cooper-Bessemer Appoints Bartlett Dallas Manager

R. F. BARTLETT

The promotion of R. F. (Tad) Bartlett to manager of the Dallas branch, has been announced by Robert F. Lay, vice president and general sales manager of Cooper-Bessemer Corp. Bartlett will be responsible for supervision of activities on direct sales, engineering, and service contacts in the application of reciprocating and centrifugal compressors for pipeline, refinery, and petrochemical use.

As manager of the Dallas branch, Bartlett will be under the supervision of the district management, comprising A. A. Burrell, vice president and southwestern district manager, and C. H. Sanders, assistant southwestern district manager.

Bartlett has been with Cooper-Bessemer since 1934 in the field application of engines and compressors.

Bere Appointed General Manager by Axelson

James F. Bere has been appointed general manager of Axelson Manufacturing Co., Los Angeles, a division of U. S. Industries, Inc., John I. Snyder, Jr., chairman of the board and president, has announced.

Bere previously was general manager of the Hamilton, Ohio, plant of Clearing Machine Corp., another division of U. S. Industries. Howard W. Carlisle, formerly assistant sales manager of the Clearing division, will succeed Bere as general manager of the Hamilton plant at Clearing.

Bere has been in the Clearing organization since 1946 serving in various capacities. Carlisle has been with Clearing Machine since 1940.

Oilwell Appoints in Gulf Coast and Midwest Areas

The appointment of Clarence J. Schaefer and Ralph W. Rice as field representatives at Big Spring and Andrews, Tex., and the transfer of Joseph R. Nye from Sherman to Pampa, Tex., have been announced by William Miskimins, Central Midwest area manager of the division. Appointment of Winifred Berl Potts as manager at the Kermit, Tex., store was also announced.

Naming of Gene E. Hatton, Nickola S. Butirich, and Howard D. Harris as field representatives at Beaumont, Tex., Harvey, and New Iberia, La., have been announced by M. F. Jones, Gulf Coast area manager. James S. Necessary, field representative, has been transferred from Lake Charles to Houma, La.

Schaefer was employed by Oilwell in 1955 at Big Spring. Rice joined Oilwell in 1954 at Denver City, Tex., and

SPANG

MOLLOY BITS *are*

Superior

THE PROOF IS IN THE DRILLING. Think about this. Actual performance records compiled by drillers everywhere testify to the superiority of Spang Molloy Bits. Known results prove these completely heat-treated high molybdenum silicon alloy steel bits drill faster at lower cost in the hardest and/or most irregular formations. Its stronger blade section and greater pin strength enables the Spang Molloy Bit to overcome the abrasion and battering which causes ordinary bits to fail.

Play it smart and beat your tough drilling problems with Spang Molloy Bits!

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For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.

in 1955 was transferred to Andrews. Nye, who joined Oilwell in 1949, has served the division at Borger, Gainesville, and Sherman. Potts, who came to Oilwell in 1952, was appointed field representative at Big Spring in 1955.

Hatton was employed at Beaumont in 1955. Butirich joined the division at the Harvey store in 1955. Harris was employed by Oilwell in 1955 at the New Iberia store. Necessary has served as field representative at Jennings, Lake Charles, and New Iberia. In 1953 he was appointed manager of the New Iberia store and 2 years later was named Lake Charles representative.

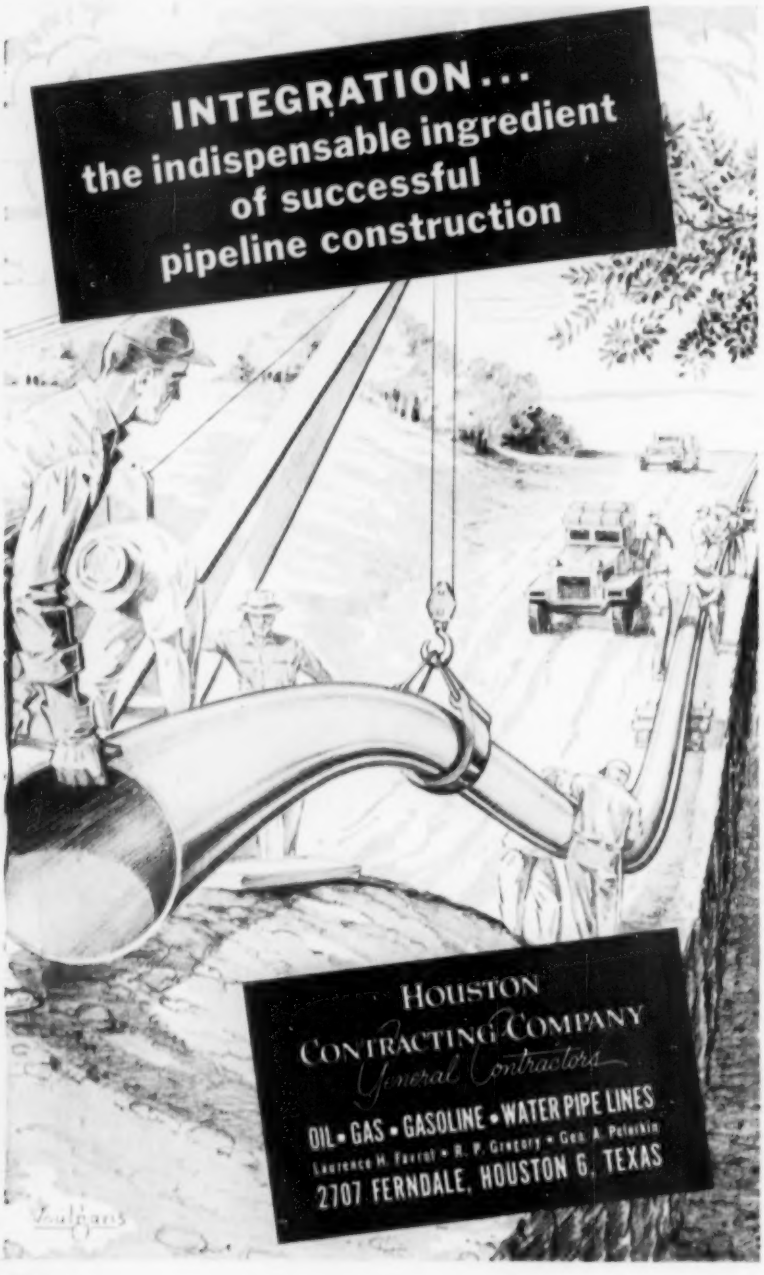
McCauley Named in Shand And Jurs Realignment

B. G. McCAULEY

Shand & Jurs Co. of Berkeley, Calif., has divided its operations into four principal divisions: sales, headed by E. E. Jurs; electrical-products division with A. E. Jurs in charge; mechanical-products division under P. C. Jurs; and finance division in charge of Bruce G. McCauley. R. M. Young remains as president.

A new plant in Berkeley, housing the electrical-products division, releases space in the main plant for expansion of the mechanical-products division.

McCauley will have supervision over purchases, accounting, office services, and industrial relations. His previous experience includes management engineering, serving as mechanical engineer with Standard Oil Co. of California, and as assistant purchasing agent for Curtis Manufacturing Co.



Jas. P. Marsh Corp. Names Kirby as District Manager

HARRY KIRBY

Harry Kirby has been appointed district manager, with headquarters in Cleveland, for Jas. P. Marsh Corp., according to James Emmett, Jr., vice president.

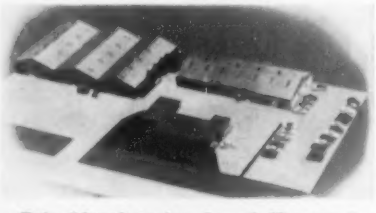
Kirby will direct the sale of Marsh instruments and valves in Ohio, Pennsylvania, and a large portion of New York. He has been with Jas. P. Marsh since 1939.

Davison Appoints Benedict

John Benedict has been appointed district sales manager with headquarters in New York City of the petroleum-catalyst department of Davison Chemical Co., a division of W. R. Grace & Co.

Benedict, who came to Davison in 1950 as a field service engineer, has been in the Houston office since 1954.

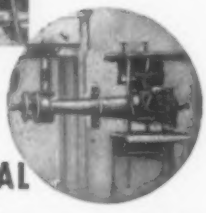
Rolo Ends First Phase Of Expansion Program



Rolo Manufacturing Co. of Houston has announced completion of the first stages of a planned quarter-million-dollar expansion program now in progress. Plant buildings and manufacturing facilities have been greatly increased, and an increase in company personnel and stocks of finished products is anticipated. Rolo is expanding its engineering and research operations to meet the requirements for any type of automatic metering installation.

R. K. Franklin, founder and president of the company, states that the present expansion program is the fourth major expansion in 4 years.

VERTICAL



OR

HORIZONTAL

many more hours on stream without forced shutdown with NATIONAL AIROIL

OIL-GAS TANDEM COMBUSTION UNITS

Exclusively for vertical firing, the new National Airoil VERTICAL Tandem Block Units retain all the features of our regular horizontal Tandem Units . . . **plus:** special, precast refractory shapes for easier, cost-saving vertical installation and maintenance; secondary air inlet louvres for positive control of vertical flame pattern; and, all steel duplex detaching gear which enables swift, simple vertical burner changeover.

VERTICAL and HORIZONTAL Tandem Units hold air in the combustion zone until fuel and heated air are thoroughly mixed. This means that ignition takes place in a hot zone; the result: high fuel economy through more rapid combustion with a minimum of excess air. NATIONAL AIROIL's patented Tandem Combustion Units allow secondary air to be easily and accurately controlled. By adjusting air control louvres, flame can be shaped to radiate heat uniformly without tube impingement.

The VERTICAL or HORIZONTAL Tandem Unit is always fired with NATIONAL AIROIL Combination Oil and Gas Burners . . . has a high turndown ratio with a steady flame temperature using either fuel oil or gas. With the TANDEM UNIT's clean flame, a cold furnace can be brought to full capacity in a short time.

"Many, many more hours on stream, without shutdown" . . . yes, YOU will realize higher profits from YOUR heaters when NATIONAL AIROIL VERTICAL or HORIZONTAL Tandem Units are specified. Our new Bulletin 498 is yours for the asking.

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INDUSTRIAL OIL BURNERS, GAS BURNERS, AND FURNACE EQUIPMENT

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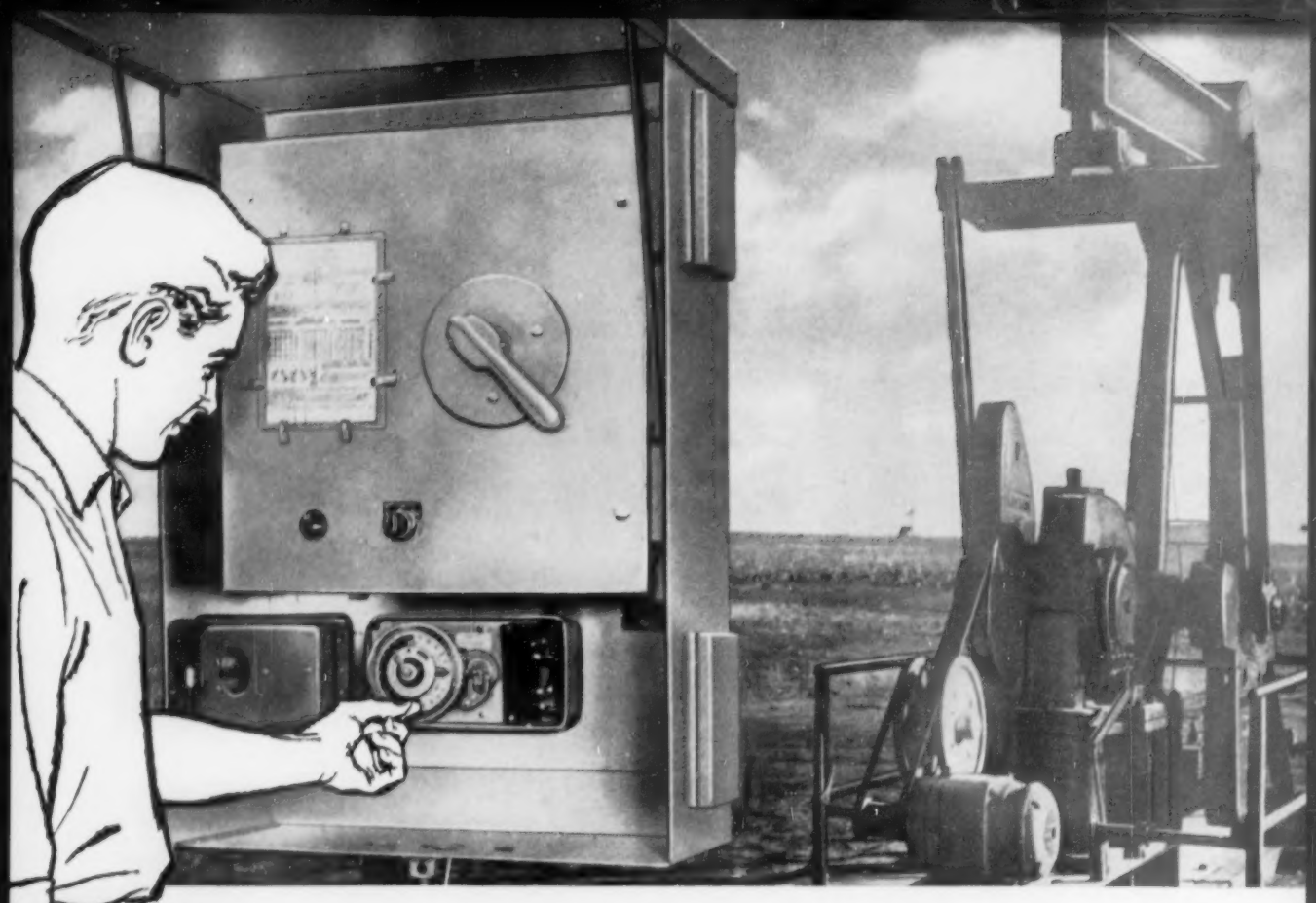


"Practically thinks for itself"

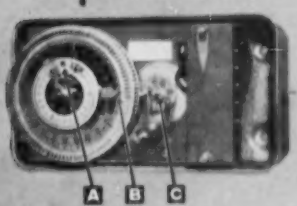
The new Cutler-Hammer Three-Star Oil Well Pumping Control has performed so successfully and proven so completely dependable that the leading oil field men everywhere insist on C-H control for all their pumping wells and accept no substitutes. Ask these men why and they will tell you, "That new C-H three-star control beats them all. No matter how tough it gets, our pumps keep pumping; and that Supertimer practically thinks for itself." Your first pumping well equipped with Cutler-Hammer control will prove to you what these men know . . . Cutler-Hammer Three-Star Oil Well Pumping Control will out-perform, out-protect, out-last and serve better than all others.

This control has *everything*, particularly the engineered dependability so vital in any automation . . . nothing is left to chance. Insist on the finest, insist on Cutler-Hammer . . . leading manufacturer of *automation* control.

Your nearby Authorized Cutler-Hammer Distributor is stocked and ready to serve you. Order from him today. CUTLER-HAMMER, Inc., 1453 St. Paul Avenue, Milwaukee 1, Wis. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

Member American CUTLER-HAMMER ★ ★ ★ MOTOR CONTROL C-H *Petroleum Institute*

New CUTLER-HAMMER Supertimer



This is *automation* in action. You pre-set the Supertimer to meet your field allowable and the control will do the rest, automatically. It starts, stops, restarts and cycles indefinitely, precisely according to your schedule. If a power outage occurs, any number of C-H controlled pumps can be restarted in an exact sequence to avoid overloading the power lines on inrush. Unfortunate coincidental starting of even two pumps is impossible.

- **A** Sets the precise restarting time delay from zero to 180 seconds. This is exclusive with the Supertimer—random starts or coincidental starts of even two pumps are impossible.
- **B** Sets the daily pumping schedule—pull a tab for each fifteen minutes of pumping, space them through the daily 24 hour period as desired.
- **C** Sets the weekly pumping schedule—1, 2, 3, 4, 5, 6 or 7 days per week as desired.

COMPLETE PROTECTION
The control is protected against lightning with exclusive, advanced-designed lightning arresters; and the three coil overload relay protects the pump motor from overloading and dangerous single phasing which often results from lightning.

CHIMNEY DRAFT VENTILATION
The heat-reflecting, aluminized enclosure insures a constant circulation of air . . . no nuisance tripping because of trapped heat.

DUST SAFE CONTACTS
Dust-Safe vertical contacts stay clean and eliminate the necessity of contact replacement common to other designs.

Thirty-five States Are Map-Delinquent

by Frank J. Gardner

OVERHEARD in a Tulsa restaurant: "Oh, yes, he's in the oil business. And he must be doing very well, because he's **always** got a map in his hand!"

So you see, a map in the hand is worth two in the files.

And the No. 1 requirement for an oil man is a map. Without it, he'd be lost. He works with some kind of a map about 90 per cent of his working time. He demands (and gets) the best that money can buy. He assumes that no matter where he goes or what he does, he'll be able to buy new ones.

But will he? Has it ever occurred to you that only 13 states in this country have ever been completely mapped? That shocker was brought home to the public in a recent release by the Department of the Interior. And did you know that, of the 13, only Kentucky is completely covered by **modern** mapping? A glance at the map on this page may drive the point home more clearly.

Interior was concerned with topographic mapping, of course, but those are the maps that form the ultimate base for all other maps. In the oil country, we have access to excellent map coverage in areas of development, but get away from the oil areas, and there's a different story. Suppose somebody discovered an oil pool in North Carolina—think you could find a good, up-to-date map? Probably not.

A huge task . . . The United States Geological Survey has a huge task ahead of it, and it needs the cooperation of the various states if it's to be finished. In its attempts to complete the National Topographic Atlas, it has had such cooperative programs at one time or another with all but one of the states and with Hawaii and Puerto Rico. But in contrast to Kentucky's 100 per cent coverage with modern mapping, the nation over-all has less than 40 per cent coverage at standard scales. To finish the job, and to revise outdated maps in those states already covered, will require many millions of dollars and many years of work. It took 780 quadrangle maps to cover Kentucky's 40,395 sq. miles, and the work was accomplished through cooperation of the survey with the Kentucky Agricultural and Industrial Development Board. The state appropriated $3,180,000, and the amount was matched dollar for dollar by the federal Government.

With a history of neglect . . . Such cooperative agreements date back to 1884 with congressional approval of the first project in Massachusetts. That state followed through until complete coverage was obtained, and although every state, at one time or another, has sought federal mapping aid, only the 13 shown on the map have completed their projects. It's a history of neglect.

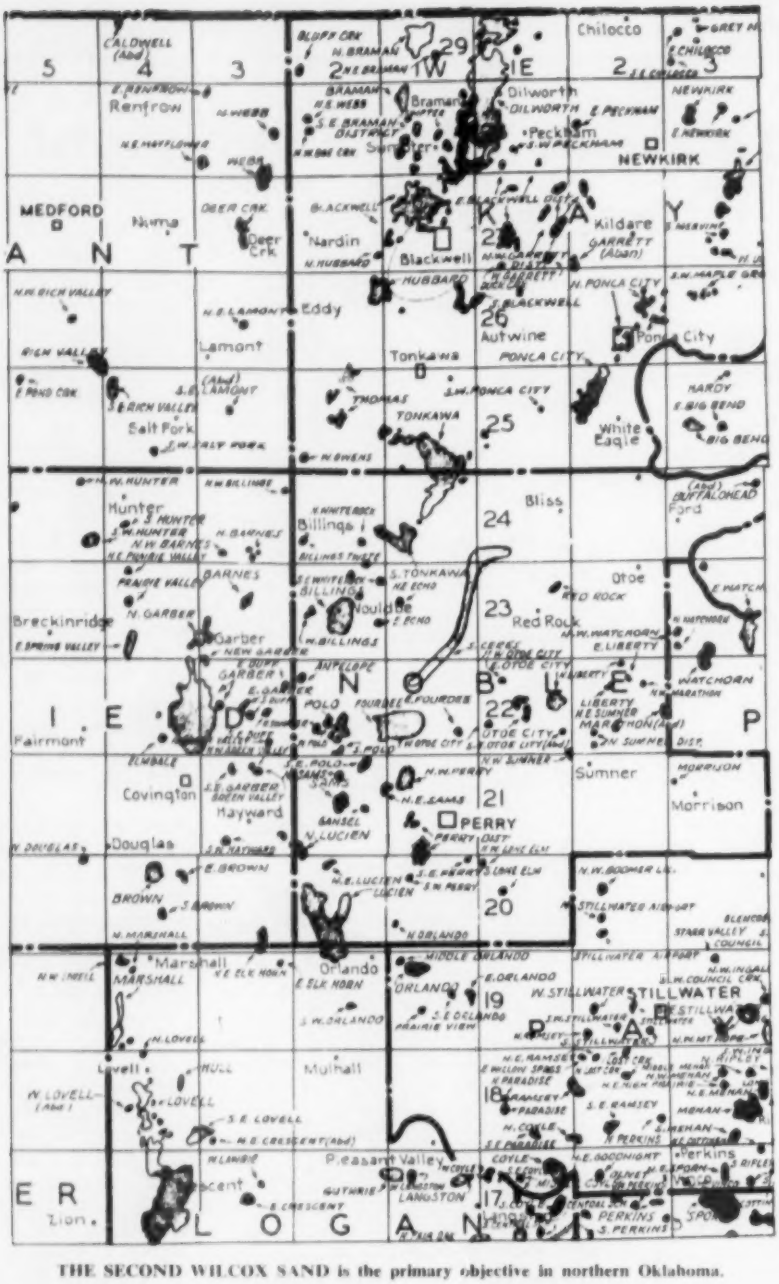
Also in 1884, Maj. J. W. Powell, the second director of the USGS, estimated that the United States could be mapped completely in 24 years at a cost of $18,000,000. That was a vast undertaking in those days, and it was never completed. Forty years later, in 1925, Congressman Temple of Pennsylvania introduced a bill providing for complete mapping of the nation in 20 years. The Temple bill became law, but no funds were provided to implement it, and 10 years later, federal funds appropriated for topographic mapping were less than $200,000—about the same as in 1885.

World War II demonstrated the vital importance of maps, and to meet an unprecedented demand, the facilities of the USGS were greatly expanded. Since that time, new methods and instruments have stepped up the rate of mapping from about 12,000 sq. miles in 1943 to about 133,000 sq. miles in 1955. But vast areas still lie unmapped.

Must be stimulated . . . The nation has never been as map-conscious as it is today. In 1940, the USGS distributed 704,000 maps. In 1955, it distributed 3 million. The figure will continue to rise, for today's businessman has learned to use the topographic map. He won't build a plant, a road, or a service station until he's examined a detailed map of the proposed area. Answering the need, the Survey has turned out about 625,000 sq. miles of new maps since 1946, and has another 870,000 sq. miles "in the works." The cost to the taxpayer is figured at about $90 per sq. mile for the 1:62,500 scale and about $175 for the more detailed 1:24,000 scale. That breaks down to about 15 to 25 cents per acre.

So it's a worth-while project, badly needed, at bargain prices. Kentucky has set an example for other states to follow, and oil men can be a great help in stimulating mapping progress. Who knows, you may need that map of North Carolina next week!

ONLY 13 OF THE 48 STATES have been completely covered by topographic mapping; of these, only Kentucky is blanketed by modern maps.


MEDFORD
Renfrow
Numa
Deer Crk.
Nardin
Blackwell
Eddy
Lamont
Tonkawa
Autwine
Ponca City
Kildare
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Peckham
Braman
Dilworth
Chilocco
Hunter
Billings
Bliss
Ford
Breckinridge
Garber
Red Rock
Otoe
Fairmont
Covington
Douglas
Hayward
Sumner
Morrison
Perry
Marshall
Orlando
Stillwater
Lovell
Mulhall
Pleasant Valley
Langston
Perkins
Zion
Caldwell (Abd)
Grey
Harding
Big Bend
Watchorn
Liberty
Maramec
Council
Inglis
Blackwell Dist.
Garrett (Abdn)
Hubbard
Thomas
Tonkawa
Ponca City
White Eagle
Buffalohead (Abd)
Billings Twsite
Polo
Fourbee
Otoe City
Sumner
Perry
Lucien
Orlando
Stillwater
Paradise
Coyle
Goodnight
Perkins
Crescent (Abd)
Lovell (Abd)
Lamont (Abd)
Maple Grove
Hardy
Ponca City
Watchorn
Marathon (Abd)
Stillwater Airport

producer. The result is a small but profitable oil field.

Example 3 . . . O. F. Warren Exploration Co. used a similar approach to uncover Northeast Thomas field in Kay County. The prospect was located on an extension of a known structural trend and mapped with geophysical work. Drilling proved up a small 80-acre multiple-pay oil field. Production is from the Mississippian chat and the first and second Wilcox sands.

Details for the Exploration Program

Seismic program . . . Shooting costs vary in northern Oklahoma, depending upon the contractor, local conditions, length of contract, etc. Seismic contracts are let in several ways: (1) a shot-hole basis; (2) by the day; (3) by the job, or (4) by the month. Shooting costs of $75 per shot hole or $600 per day are reasonable.

The area of interest seldom covers over 320 acres so that 2 to 4 days shooting at a cost of under $24,000 confirms or eliminates the subsurface prospect. If there is any question about the results, a review by a competent geophysicist will cost well under $500.

In most instances, the prospect is not a seismic prospect, but a first-rate subsurface lead that is then checked with shooting. The exploration program is a combination geological and geophysical approach with the seismic supplementing the subsurface data.

Typical exploration project . . . The cost of a seismic project in northern Oklahoma depends to a large extent upon the budget. Table 1 lists two exploration programs, one for a rather limited budget, the other for a larger operation. Experience has shown that shooting will confirm at least 25 per cent of the first-rate subsurface leads. And, as a matter of fact, some companies would drill this type of subsurface lead without the benefit of shooting. National averages show that about one out of every five seismic prospects is commercial. Thus a seismic program that checks 20 subsurface prospects is expected to turn up five drillable prospects. And at least one of these leads should produce.

Estimated cost of a 20-prospect program (A on Table 1) is $64,000, with 63 per cent of the expense going into the shooting and the balance into leasing. A larger budget geared to handle 60 prospects is outlined in Column B, Table 1. In either program, the ratio of shooting costs to leasing costs is constant and roughly 2:1.

It is axiomatic that only open acreage or that available through farmout is checked by shooting. Some operators even secure the leases, farmout letter, or a geophysical option prior to shooting. This eliminates the problem of competition for the lease should the lead check out.

Drilling the prospect . . . Operators use any one of several methods of financing the drilling program. Table 2 is only a partial list since there are about as many ways to finance a drilling deal as there are deals.

If the operator wants to assume all

TABLE 1—EXPLORATION COSTS IN NORTHERN OKLAHOMA

Size of exploration budget—	(A) Smaller scale operation	(B) Larger scale operation
Number of subsurface leads	20	60
Seisimc work at $2,000 per lead	$40,000	$120,000
Number of drillable prospects (i.e. confirmed by shooting)	5	15
Leasing costs (320 acres per prospect at $15 per acre)	24,000	72,000
Total cost of exploration program	64,000	192,000

TABLE 2—POSSIBLE WAYS OF FINANCING DRILLING PROGRAM

	1 Drill wells straight up; retain full working interest		2 Sell prospects; retain ⅛ O.R.R.I.		3 Free ride on initial test and retain ¼ working interest		4 Sell prospects; retain ⅛ working interest after payout on each prospect	
	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
Total cost of initial exploration program (Table 1)	$64,000	$192,000	$64,000	$192,000	$64,000	$192,000	$64,000	$192,000
Revenue from sale of prospects			$40,000	$120,000			$40,000	$120,000
Total cost of initial wildcats ($30,000 for a 5,000-ft. test)	$150,000	$450,000						
Completion and equipment costs on successful wildcats (1 in 5)	$25,000	$75,000						
Development drilling costs ($55,000 per well; 3 addn. wells per pool)	$165,000	$495,000			$41,250	$123,750		
Total costs of drilling and developing new oil fields	$340,000	$1,020,000			$41,250	$123,750	*($27,500)	*($82,500)
Total cost of exploration and developing	$404,000	$1,212,000	$24,000	$72,000	$105,250	$315,750	$24,000	$72,000

*Drilling costs deducted from oil runs.

TABLE 3—ECONOMICS OF SEISMIC EXPLORATION IN NORTHERN OKLAHOMA

	1 Full working interest		2 ⅛ O.R.R.I.		3 ¼ working interest		4 ⅛ working interest after payout	
	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
Total reserves discovered (80 acres per field; 7,500 bbl. per acre ultimate recovery), bbl.	600,000	1,800,000	600,000	1,800,000	600,000	1,800,000	600,000	1,800,000
Net reserves (⅜ to landowner deducted), bbl.	525,000	1,575,000	32,800	99,200	131,250	393,750	65,600	196,800
Actual value of net reserves at $2.80 per bbl.	$1,470,000	$4,410,000	$92,000	$276,000	$367,000	$1,101,000	*$156,500	*$469,500
Value of reserves with lifting costs of $0.50 per net bbl. deducted	$1,210,000	$3,630,000	$92,000	$276,000	$301,000	$903,000	*$123,700	*$371,000
Total cash outlay	$404,000	$1,212,000	$24,000	$72,000	$105,250	$315,750	$24,000	$72,000
Cost per barrel of new oil	$0.77	$0.77	$0.73	$0.73	$0.80	$0.80	$0.19	$0.19
Ratio of profit to actual investment before taxes	2:1	2:1	2.8:1	2.8:1	1.9:1	1.9:1	4.1:1	4.1:1

*One-eighth of drilling costs has been deducted from oil runs.

the risk, he can drill the prospect straight up. On the other hand, he may want to cut down on his risk and promote a test, retaining a fourth working interest and a free ride on the initial test into the tanks (Method 3, Table 2).

This method has the obvious advantage of no risk on the initial test on the block. The small operator who carried out the exploration considers, and rightly so, that his exploration costs justify the working interest. In some instances the retained working interest may run as high as 50 per cent instead of the fourth.

Economics of seismic work . . . Admittedly it is exceedingly difficult to forecast what the finding cost will be on any given set of prospects but the figures shown (Table 3) are based upon conservative estimates. With good luck, an oil company might do considerably better, but there have been instances where a company has drilled 20 or even 30 dry holes in a row. However, it would appear that finding costs of $0.80 per barrel are reasonable from this type of exploration program.

The Wilcox microstructures are small in areal extent, covering only 40 to a maximum of 320 productive acres, but reserves are high, especially when compared to those in Pennsylvanian sands in the same general area. The best evidence to show that Wilcox exploration is profitable is the production data from some of the small producing fields (Table 4). The estimated ultimate recovery from the selected fields is 7,500 bbl. per acre.

TABLE 4—PRODUCTION DATA FROM REPRESENTATIVE WILCOX MICROSTRUCTURES

Field (county), location—	Disc.	Wilcox producing acreage	Cumulative production (bbl.)	Recovery to date* (bbl. per acre)	Years producing	Estimated ultimate prod. (bbl. per acre)
Barnes, North (Garfield), 24n-3w	1926	120	199,000	1,650	28	2,000
Brown, East (Garfield), 20n-4w	1945	120	124,000	1,030	9	7,500
Hunter, Southwest (Garfield), 24n-5w	1945	350	584,000	1,670	9	2,500
Lamont, Southeast (Grant), 25n-3w	1937	80	856,000	10,700	17	11,000
Pond Creek, East (Grant), 25n-5w	1951	240	436,000	1,810	3	6,000
Renfrow, East (Grant), 28n-3w	1949	80	233,000	2,920	5	5,800
Rich Valley (Grant), 25n-4w	1949	390	713,000	1,815	5	3,600
Webb, North (Grant), 28n-3w	1948	180	902,000	5,000	6	8,350
Doe Creek, Northwest (Kay), 28n-2w	1951	110	154,000	1,400	3	4,660
Garrett (Kay), 27n-2e	1949	160	600,000	3,750	5	7,500
Webb, Northeast (Kay), 28n-2w	1952	80	256,000	3,200	2	16,000
Central School, West (Logan), 17n-1e	1951	340	1,349,000	7,000	3	13,300
Coyle, Southeast (Logan), 17n-1e	1951	240	1,514,000	6,300	3	21,000
Guthrie Townsite (Logan), 17n-2w	1942	100	438,000	4,380	12	5,000
Seward (Logan), 15n-3w	1936	70	223,000	3,200	18	3,500
Billings, West (Noble), 23n-2w	1945	120	389,000	3,240	9	3,500
Belmont, West (Lincoln), 11n-5e	1950	280	250,600	900	4	2,250
Chandler, South (Lincoln), 13n-4e	1951	175	550,000	3,140	3	10,500
Ingalls, Northwest (Payne), 19n-4e	1934	80	107,000	1,340	20	1,500
Paradise (Payne), 18n-1e	1951	200	174,000	870	3	2,900
Ripley, North (Payne), 18n-4e	1923	120	2,412,000	20,000	31	21,000
Total		3,635	12,463,600	3,420		7,500

*Through 1954.

EXPLORATION HIGHLIGHTS

PACIFIC COAST

CALIFORNIA

Union Misses in San Mateo County

Union Oil Co. of California failed to repeat its earlier successes in San Mateo County when they abandoned the 6,027 ft. Western-Gulf-Richfield-Moore wildcat in the Peters Creek region last week. This wildcat, located NW SE 31-7s-3w, was approximately 4½ miles northwest of Union's earlier discovery at Oil Creek.

Movie Lot Deep Test

Universal Consolidated Oil Co.'s deepest test on its 20th Century Fox movie lot lease has been plugged back for completion in an upper sand at 9,410 ft. after an unrecoverable fish developed at 11,835 ft. The operator plans to perforate through the 7-in. casing for the completion. Universal reports the bit was still in the Miocene at 11,835 ft. when drill pipe stuck.

Texaco Hits at Beehive Bend

The Texas Co. gave the North Beehive Bend gas field in Glenn County a new pool discovery with completion of 2 Benamati in SW SW 4-19n-2w. Texaco drilled the wildcat to 7,204 ft. where it perforated and tested three intervals between total depth and 6,255 ft. without success. The operator then plugged back to 4,840 ft. and completed the well as a gas discovery at 4,745-65 ft.

Shell Quits Strand Test

After a string of prolific completions in the Posuncula area of the Strand field, Kern County, Shell last week missed on a northwest offset to its Grapevine 83 pool discovery of late last year. Shell abandoned 72-8 KCL after failing to find production to 10,005 ft. This offset was just one location northwest of 83-8 KCL which Shell completed last October as a new Miocene pool discovery at 9,771-9,852 ft. flowing 572 bbl. daily. Both the discovery and 72-8 KCL are located about 2 miles east of the Posuncula area.

Ventura Wildcat Scheduled

Ken-Cal Oil Co., Union, Monterey and Richfield will drill to around 6,000 ft. north of Shiells Canyon field, Ventura County. The project will be 1 Calumet, in Section 34-4-19.

Exploration This Week

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WEST TEXAS-NEW MEXICO

WEST TEXAS

Seminole Field Has Devonian Prospect

West Seminole (San Andres) field in western Gaines County had prospects of a new and deep pay at Cities Service Oil Co. 9 Proctor. At this writing the well had made substantial recoveries of free oil on drill-stem tests.

No. 9 Proctor entered the Devonian at 11,100 ft. on elevation of 2,465 ft. Initial test of the Devonian at 11,102-40 ft. recovered mud with light oil shows. A 2-hour and 50-minute test at 11,130-72 ft. recovered 1,320 ft. of oil, with bottom-hole flowing pressure at 805 psi.

A 2½ hour test in the Devonian at 11,167-11,224 ft. recovered 3,464 ft. of oil cut 6 per cent with mud, plus 1,000 ft. of water cushion, and 270 ft. of oil and gas-cut mud below the circulating sub. Gravity of the oil was 32.9°.

Cities Service 9 Proctor found additional pay section in testing at 11,222-80 ft., then recovered sulfur water along with 1,000 ft. of oil at 11,278-11,330 ft. Prospects were for at least 180 ft. of Devonian pay.

No. 9 Proctor is located in Section 355, Block G, CCSD&RGNG Survey, 10 miles northwest of Seminole. It is a multi-pay prospect, having indicated produtcion from a Permian section believed to be Leonard, at 8,722-86 ft., and from the Mississippian at 10,770-10,808 ft.

Mississippian shows . . . Shell Oil Co. 1 John Schumacher, wildcat in southeastern Gaines County, was drilling ahead below 12,271 ft. after recovering oil from the Mississippian. Projected depth of the well is 13,000 ft.

The oil recovery came on a test at 12,110-12,200 ft. In 3 hours recovery was 120 ft. of 37.7° oil, plus 180 ft. of oil and gas-cut mud. Shut-in pressure reached 5,335 psi. Location is in Labor 11, League 298, Reagan CSL, 23 miles southeast of Seminole.

Strawn Discovery Assured For Garza County

Southeastern Garza County had a Pennsylvanian Strawn prospect just northwest of San Andres wells in the South Rocker "A" field.

Neville G. Penrose et al 1-X Miller, in 39-6-H&GN Survey, ran a 56-minute drill-stem test at 7,610-85 ft., identified as the middle Strawn. Gas surfaced in 7 minutes and oil in 29, at the estimated rate of 40 bbl. an hour. Operators circulated out a full string of oil. Flowing pressure on the test ranged from 1,710-2,810 psi., and shut-in pressure reached 3,275 psi. Gravity of the oil was 36.5°.

Initial test of the lower Strawn, between 7,705-35 ft., recovered mud and salt water with no shows. At 7,735-60 ft., a 71-minute test had clean flowing oil in 29 minutes, estimated at the rate of 25 bbl. an hour. Recovery below the circulating sub was oil and gas-cut mud with no water. Flowing pressure on the test was 1,115-2,555 psi. Operators drilled ahead on an 8,500 ft. contract.

New Strawn Production In Tom Green County

Southeastern Tom Green County has been assured new Strawn oil production at Amerada Petroleum Corp. 1 J. Willis Johnson, 10 miles east of Christoval.

On production test through perforations at 4,973-5,015 ft., the well flowed 51 bbl. of new oil and 3 bbl. of acid water in 24 hours through 18/64-in. choke. Testing continued.

Top of the Strawn lime was 4,960 ft., with the main Strawn at 5,013 ft. on estimated elevation of 2,355 ft. Location in Section 29 Block 25, H&TC Survey is 2 miles south of Strawn production in Susan Peak field, but separated from the field by a deep failure.

Dykes Drilling Co. 1 Duff, indicated Strawn discovery in the southwestern corner of Tom Green County, has set casing at 6,956 ft. for further testing. This well indicated production on a drill-stem test of the Strawn.

Amerada Petroleum Corp. 4 Joan Chambers Denis, wildcat 13 miles southeast of Vancourt, recovered slightly oil and gas-cut mud on a drill-stem test in Strawn between 4,312-50 ft. Other drill-stem tests and results were: Canyon sand, 3,990-4,015 ft., recovery was 90 ft. of mud cut 20 per cent with oil. In the Home Creek, 3,755-93 ft., gas flowed and recovery was 60 ft. of gas-cut mud. In the Cisco lime at 3,305-70 ft., recovery was 70 ft. of slightly gas-cut mud and 91 ft. of salt water.

Dawson County . . . Drilling & Exploration, Inc., has completed a confirmation well to the discovery of Wells-Devonian field 2 miles southwest of Mungerville in Dawson County.

The company's 2 Wells completed for 327 bbl. of oil a day on the pump, plus 109 bbl. of water, from perforations at 12,054-60 and 12,066-72 ft. Location is in Labor 19, League 4, Taylor CSL.

Johnson-Grayburg Field Has Rapid Development

The Johnson-Grayburg field in central Ector County, 9 miles northwest of Odessa, received its fifth and sixth completions last week, plus seven new starts. Four of the new projects are outposts and three are more than one location from present production.

Zapata Petroleum Corp., Robert Dean and Robert LeBlond have completed the fifth producer, and have filed applications to drill the seven additional wells. Zapata's new projects, all scheduled to 4,500 ft., are: No. 4 J. L. Johnson, ¾ mile south of production, in Section 45, Block 43, Township 1 South, T&P Survey; No. 3 Johnson, ½ mile south of production, is in the same section. No. 3-A Johnson, on the southeast side, is in 41-43-T1S-T&P; No. 6 Johnson, on the south side, is in Section 45, as is the 5 Johnson, which will be ¾ mile south of a recently completed south extension well. Wells 4-A Johnson and 2-A Johnson are both in Section 41-43-T1S-T&P. Average ground elevation is 3,019 ft.

The field's fifth producer and ⅝-mile east extension is Zapata 8 Johnson, Section 45. Completion potential was 275 bbl. of 34.6° oil, through 18/64-in. choke from open hole at 4,093-4,177 ft.

Sixth producer from the field was Texas Pacific Coal & Oil Co. and Eastland Oil Co. 2-C-2 Johnson, 44-43-T1S-T&P, which made 50 bbl. of oil a day from perforations at 4,298-4,314 ft. This well is a location west extension.

Crane County dual producer . . . The Waddell field gained its third Devonian and Silurian producer with dual completion of Gulf Oil Co. 226 Waddell, in Section 14, Block 23, PSL Survey, 16 miles northwest of Crane. Combined potential was 866 bbl.

Devonian potential, which also ex-

tended that pay ½ mile southwest, was 267 bbl. of 39° oil a day through ⅜-in. choke. Pay was perforated at 8,970-9,530 ft. Top of pay was 8,970 ft. on elevation of 2,751 ft. Gas-oil ratio was 1,197:1 and flowing pressure on tubing was 255 psi.

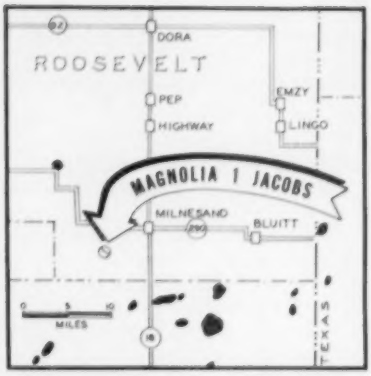
Silurian potential, which extended that pay ⅜ mile northwest, was 599 bbl. of 43° oil a day through 18/64-in. choke. Perforations were at 10,010-80 ft. Flowing pressure was 725 psi., with gas-oil ratio of 751:1.

NEW MEXICO

Roosevelt County Test Reports Oil Shows

Roosevelt County's first oil operation of any kind for many months has recovered oil on a drill-stem test of the Pennsylvanian, or Permo-Pennsylvanian.

The well is Magnolia Petroleum Co. 1 Jacobs-Federal, in 18-8s-35e, 4 miles southwest of the town of Milnesand. The oil show was on a 3-hour test between 12,550-12,650 ft. Gas surfaced in 17 minutes and recovery was 40 ft. of oil-cut mud, plus 2,070 ft. of 43° oil. Flowing pressure was 565 psi., and 30-minute shut-in pressure was 3,335 psi. Operators cored ahead.



Magnolia Petroleum Co. 1 Jacobs-Federal, Permo-Pennsylvanian prospect southwest of Milnesand.

Magnolia also has another Roosevelt County test, which should be under way at this time. The well is 1 Vallie Whitehead, 32-6s-34e, 7 miles southwest of New Hope, and 1 mile northeast of New Hope field. It was waiting on casing at last report. Projected depth is 8,500 ft.

Outpost Test Scheduled to Prospective Discovery

Sinclair Oil & Gas Co. has filed application to drill its 2 Seaman Unit in Lea County, ½ mile southeast of the firm's 1 Seaman, now testing as a Pennsylvanian discovery.

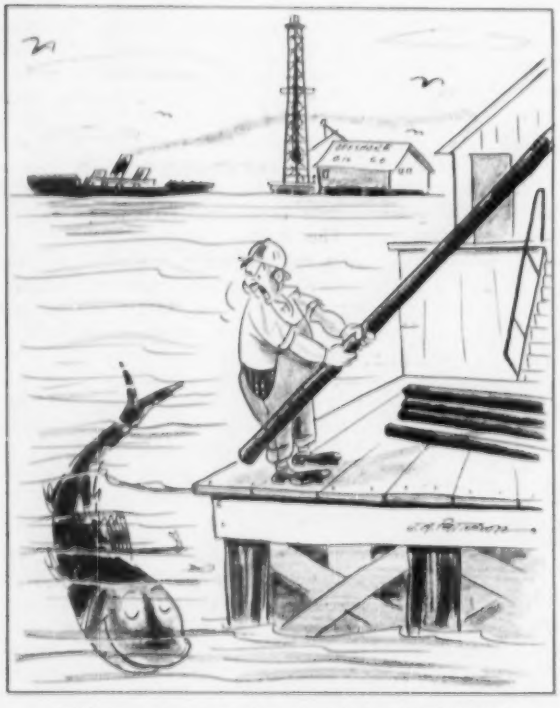
Location for No. 2 is to be NW NW 19-16s-34e, about 15 miles southwest of Lovington. Projected depth is 14,750 ft. with rotary.

Sinclair 1 Seaman Unit indicated production when it flowed an unreported amount of oil on drill-stem test at 11,206-81 ft. Operator reversed out 20 bbl. of oil. Recovery included 2,200 ft. of water blanket, 90 ft. of free oil and 90 ft. of oil and gas-cut mud, with no water.

On another test in the Pennsylvanian Strawn, at 12,675-12,700 ft., gas reached the top in 22 minutes, at the rate of 5,500 M.c.f. per day, through ⅝-in. choke. Recovery was 690 ft. of 41° oil. Flowing pressure ranged from 1,690-2,315 psi.

Sunray Mid-Continent will drill its 1-D New Mexico-Federal ½ mile north of Devonian production in Cross Roads field of Lea County. Location is in 23-9s-36e, projected to 12,500 ft.

Devonian test to plug back . . . McAlester Fuel Co. prepared to plug back to test the Pennsylvanian at its 1-EL State, 7-15s-35e, Lea County, after recovering water in the Devonian at 12,190-12,254 ft. Recovery on a 2½-



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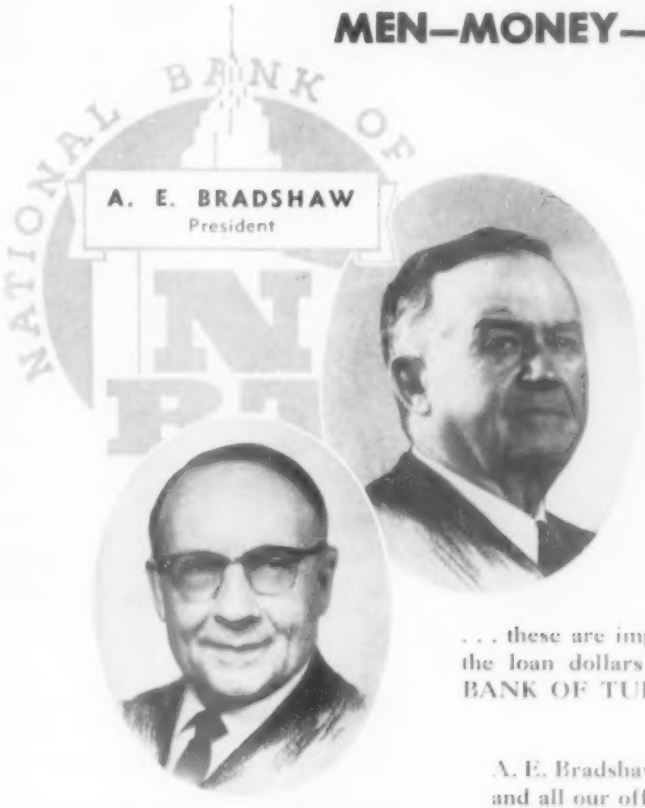
MEN—MONEY—EXPERIENCE—SERVICE



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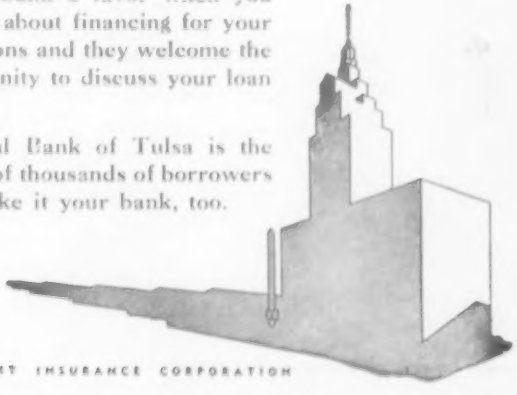

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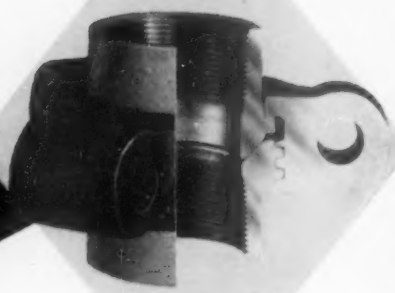

Fig. 100
1000 psi
Sizes: 2"-8"

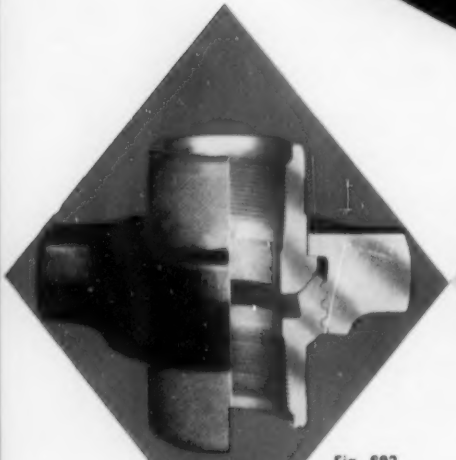

Fig. 602
6000 psi
Sizes: 1"-4"

Fig. 400
4000 psi
Sizes: 6"-12"

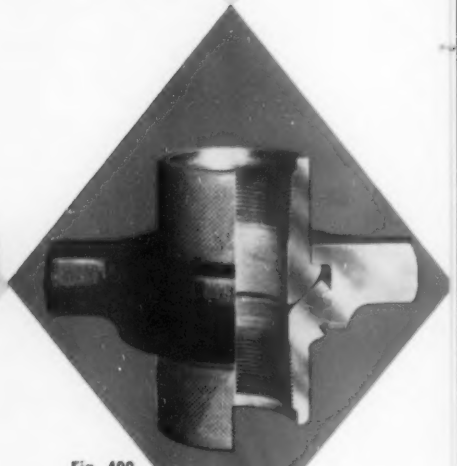

Fig. 400
4000 psi
Sizes: 2"-5½"

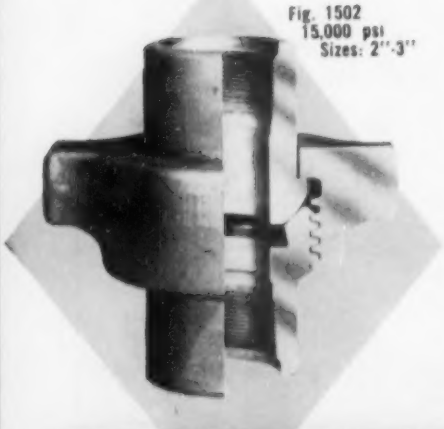

Fig. 1502
15,000 psi
Sizes: 2"-3"

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hour test was 2,110 ft. of gas-cut water blanket, 280 ft. of mud and 3,060 ft. of salty sulfur water.

The well previously had indicated production in the Cisco on a drill-stem test at 10,320-88 ft., and from another Pennsylvanian section at 11,950-90 ft.

ROCKY MOUNTAIN

NEBRASKA

Confirmation Near for New Nebraska Discovery

Lansing-Kansas City production recently discovered by M. P. Gilbert's rank wildcat test, 1 Barger, in the northwest corner of Red Willow County, on the Chadron Arch, is virtually assured of confirmation in the new area's second test, drilled by Superior Oil Co.

Superior's test, 46-2 Stephens, southwest offset to Gilbert's discovery well, recovered 24 bbl. of load oil and 6 bbl. of new oil in 4 hours while swabbing perforations at 3,844-52 ft. in the discovery well's pay. The latter well is perforated at 3,854-62 ft.

An open-hole drill-stem test of the pay at 3,845-80 ft. had recovered 270 ft. of oil and 100 ft. of mud-cut oil.

Further testing will follow acidization of the pay.

In the meantime, Gilbert, who has another wildcat drilling in the southwestern part of the county, 3 miles north of the Kansas line, has made location for an additional wildcat in this county. The latter, 1 Olsen, in 22-3n-30w, west of McCook, is about 12 miles southeast of the Barger discovery. His drilling wildcat, 1 Wilhelm, in 18-1n-29w, is another 12 miles farther southeast.

WYOMING

Alkali Buttes Deep Test Gets Shows in Phosphoria

Indications of oil and gas production in the Phosphoria horizon on the Alkali Buttes anticline, southeast of Riverton, in Fremont County, have been in a deep exploratory test being drilled by The Texas Co.

The test, 5 Unit, C NW SE 1-33n-95w, previously completed as a gas well in a younger zone at 4,247 ft., is being deepened to the Pennsylvanian-Tensleep zone. Cores from 7,123 ft. in the Phosphoria recovered fragmented dolomite with shows throughout. A 2-hour drill-stem test taking in a section at 7,155-7,200 ft. recovered 50 ft. of oil and 315 ft. of oil and gas-cut muddy water.

MONTANA

Northeast Bredette Gets Discovery Confirmation

California Co.'s second test at Northeast Bredette, in Roosevelt County, flowed at the rate of 35 bbl. of oil per hour during a drill-stem test of its discovery well's MacGowan pay zone.

The new well, 1 Iron Bear, a half mile south of the discovery well, logged top of the MacGowan at 6,722 ft. and drilled to 6,734 ft. The test took in the section from 6,712 ft. to bottom.

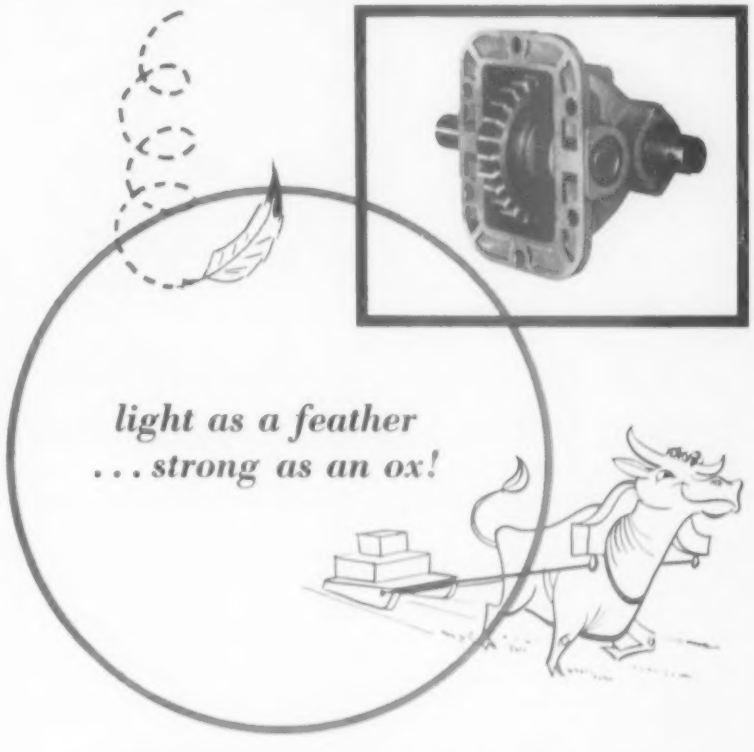
The test was through ¼-in. choke, getting gas to the top in 50 minutes and oil flow in 90 minutes. Flow was for 26 minutes, making 26 bbl.

The discovery well, 1 Paulson, C NW SW 34-33n-49e, was completed early this year with production (114 bbl. of oil per day) from the MacGowan zone at 6,720-34 ft. and Charles C zone at 6,746-50 ft.

COLORADO

Washington County Gets New "J" Sand Oil Discovery

Another "J" sand field appears to have been uncovered in Washington County. It is being opened by Sun



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Tips on Mud Valves for Toolpushers . . .

Tom J. Beaty on the left and driller, L. E. Mariner with a group of MUDWONDER mud pump manifold valves.

Slim Hole Rig Sets Drilling Records with 2000 PSI Mud and MUDWONDER Valves

By Tom J. Beaty, partner, Rig #1, Slim Hole Drilling Company, Houston, Texas

SINCE we rigged-up our new slim hole rig last July we have been setting records regularly on amount of hole per day and top to bottom time. One of the big reasons for these records, we feel, is the Rockwell-Built MUDWONDER mud valve which is used on all our mudlines.

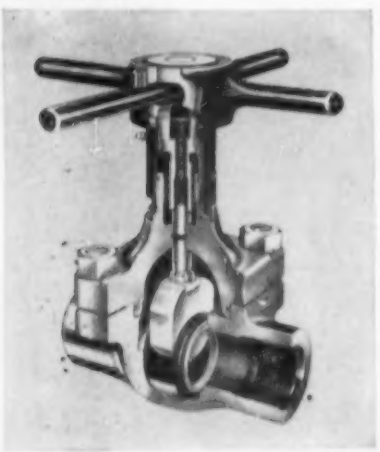
This valve has done a remarkable job for us without downtime or repairs. It's easy to operate—we use 2000 psi line pressure regularly and never have any trouble. Besides, the one-piece body does away with body misalignment and keeps repairs or part replacements, if needed, simple and quick.

For economy—and economy is the main reason for slim hole drilling so we are extremely conscious of it—we equipped our new rig with MUDWONDER mud valves. We are using them on the pump manifold, the stand-pipe, the fill-up line and the blow-out preventer manifold very successfully.

I can recommend MUDWONDER to any toolpusher having mud valve trouble. MUDWONDER valves are built in 2", 3", and 4" sizes with screwed or flanged ends and ratings of 2000 psi WP (4000 psi test) and 3000 psi WP (6000 psi test).

See your favorite oil field supplier for complete information, or write Edward Valves, Inc., East Chicago, Indiana.

MUDWONDER cut-away view shows the double thread construction, separated stainless stem and hard chromed gate with "T" slot connection and the one-piece seat insert with the buna-N molded integrally over the steel wear rings.



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Oil Co. at its 1 Peterson, a rank wildcat, in 15-3s-54w, 8 miles south of Abbott, in the southwestern part of the county.

Sun's discovery well recovered 12 ft. of oil-bearing sand in a "J" sand core at 4,817-32 ft. Two drill-stem tests were made. The first, taking in the lower 11 ft. (4,821-32 ft.), recovered 157 ft. of oil and 2,250 ft. of oil and gas-cut water.

The second test, at 4,815-22 ft., recovered 1,260 ft. of oil with 90 ft. of muddy water and 90 ft. of gas-cut mud. Tester was open 60 minutes. Final flowing pressure was 342 psi.

Cores below 4,832 ft. failed to show. Hole was carried to 4,966 ft., where casing has been run for completion of the well.

Only scattered drilling has been done in that part of the county. Nearest production is at Abbott.

ARK-LA-TEX

ARKANSAS

Flow Tests Started at Union County Discovery

El-Ark Development Co. 1-A Allen, indicated Hogg sand discovery 1½ miles northeast of Sheppard field, Union County, has started production tests at this report, but as yet no gages are available.

Perforations were made at 3,401-04 ft., after which the well kicked off and flowed to clean, with no formation water reported. Flowing through 11/64-in. choke, tubing pressure was 400 psi. Total depth was 3,716 ft. Electric log indicated sand with good shows from 3,404-28 ft. Location is in SW SE NW 25-17s-15w.

Water Cutting in At Smackover Field New Pay

Gulf Refining Co. A-28 Sid Umsted, 33-15s-15w, prospective Travis Peak oil discovery in the Smackover field, reported salt water coming in. The well flowed 146 bbl. of oil a day through 5/16-in. choke from perforations at 3,312-16 ft. on initial test. Flowing pressure was 375 psi. This test cut an estimated 4 per cent salt water.

Continuing to test, salt water percentage increased to 78. Operators were undecided on whether to squeeze off and complete as a Smackover well or try to shut the water off in the Travis Peak.

On ground elevation of 96 ft., tops were: Travis Peak 2,640 ft., Cotton Valley 3,408 ft., Buckner 4,888 ft., and Smackover 5,034 ft. Other shows were found in the Cotton Valley and in the Smackover.

EAST TEXAS

Final Test Made at Wood County Discovery

British-American Oil Producing Co. 1 Bessie Weisenhunt, Woodbine oil discovery on the Hainesville salt dome in Wood County, was given a final gage of 259 bbl. of oil a day. The flow was through ¼-in. choke from perforations at 9,217-22 and 9,228-47 ft. Gas-oil ratio during the first 12 hours of flow was 656:1.

Deep Field Test Will Plug Back for Completion

Shell Oil Co. 1 Stella Wright, in the Quitman field in Wood County, probably will be plugged back to test a section which showed oil on drill-stem test while drilling. The section was said to be a new pay zone of the Rodessa, at 8,083-8,139 ft. The well also had oil shows at 8,505-65 ft. Total depth at 1 Wright was 14,500 ft.

Anderson County . . . New Slocum area wells completed last week included J. S. Michael 1 Walters, 1 mile north of Slocum townsite. Potential was 115

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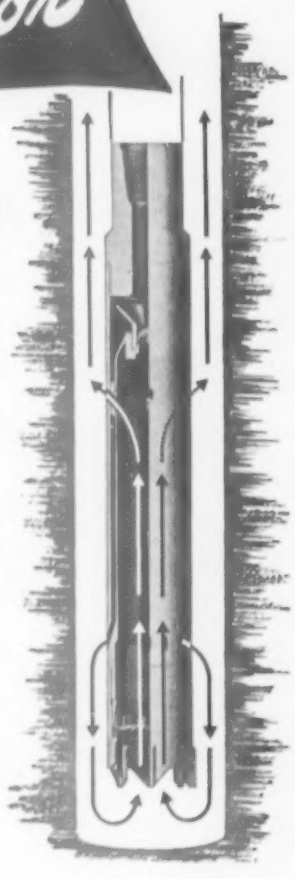

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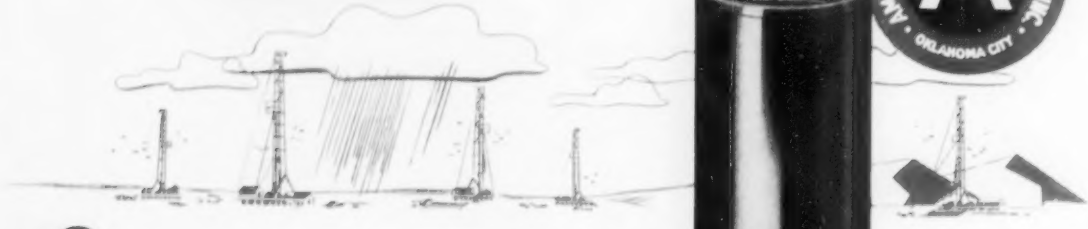

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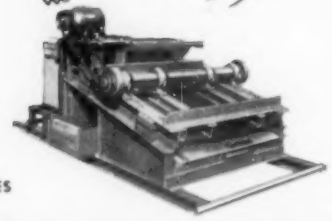

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bbl. of oil a day flowing through 10/64-in. choke, from pay at 5,683-88 ft. Hole was first carried to 5,700 ft. on this test, then plugged back to sidetrack hole and redrilled to 5,799 ft.

West of Slocum townsite, Atlantic Refining Co. 2 Charles Patterson had casing run to 5,775 ft. for completion attempt in the Woodbine. Location is a south offset to the same operator's 1 Patterson recently completed for 226 bbl. of oil a day from pay at 5,639-42 ft.

Application for an exploratory test 3 miles northeast of Slocum townsite has been filed by Bilbo-Redding, Houston, as 1 Algie Gaston estate. Location is in the Allen Killough Survey, on a 28-acre lease. Projected depth is 6,000 ft. Location is less than a half mile north of Thomas D. Humphrey 1 Whitehead, drilling ahead near 5,000 ft.

Humphrey has made locations for two additional tests in the South Slocum field. These will be 1-A G. B. Wallace, on an 81-acre lease, and the 1-A W. F. Chaffin on a 54-acre lease, both in the W. T. Sadler Survey.

NORTH LOUISIANA

North Louisiana Salt Dome To Be Drilled

Stanolind Oil & Gas Co. will test the Minden salt dome in Webster Parish, with a 10,000-ft. operation. The well will be 1 A. A. Hudson, CE½ NW NW 31-19n-8w, which is 4 miles east of Minden townsite and on the east flank of the dome.

Prospects of oil from overhanging salt domes have been given a shot in the arm by the recent successful completion at British-American's Woodbine discovery on the Hainesville dome in Wood County, East Texas. Stanolind had completed leasing and geophysical work on the Minden dome prior to the East Texas discovery, but that well is expected to influence future testing of other domes in Louisiana.

Wisner Field May Get Confirmation on Third Attempt

Prospects for a second producer at Wisner field in Franklin Parish were on the dim side until Shell 1 Irving cored and tested oil shows in the Tuscaloosa formation. Shell 1 Anderson, discovery of the field, flowed 215 bbl. of oil a day from the Lower Tuscaloosa at 7,492-98 ft. Since completion of the discovery last year, north and east offsets have resulted in dry holes.

No. 1 Irving is west of the discovery, in 3-11n-7e. Operators had about 13 ft. of gas-condensate sand, plus 12 ft. of oil sand in the Tuscaloosa at last report, and the well was still in sand.

A drill-stem test at 7,465-77 ft., using ¼-in. chokes and 1,000-ft. water cushion, was open 16 minutes. When drill pipe was pulled it blew gas, mud and condensate to pits, with estimated recovery at 180 ft. of gas-cut mud and 2 gal. of amber-colored condensate.

Drill-stem test from 7,478-90 ft., with ¼-in. chokes and 1,000 ft. of water cushion, produced an immediate blow and in 5 minutes pressure read 270 psi. The tool was open 12 minutes before mechanical trouble developed. Fluid in the pipe was reversed out, being oil and gas-cut mud, plus 2 bbl. of 38° oil. Operators stopped to run electrical surveys before running casing.

SOUTHEASTERN STATES

MISSISSIPPI

Wilcox Production Opened In Two Adams Discoveries

John S. Callon's new Wilcox discovery-well in southwestern Adams County, in the southwestern corner of the state, produced at the rate of 104 bbl. of oil per day through ⅛-in. choke at its completion last week.

The well, 1-P Armstrong, is produc-

Thompson

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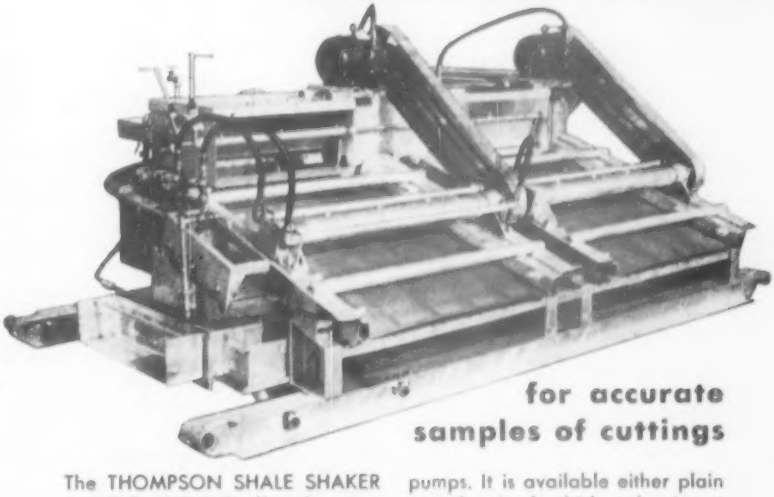

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tive from the McKittrick zone, perforated at 6,280-82 ft. It had been drilled at 6,710 ft. Its flow was with pressure of 420 psi. at the surface. Gravity of the oil is 40°.

Location is just across Mississippi River from Esperance field, in Concordia Parish, Louisiana. It is a half mile south of Butler Lake, for which the new field is named.

Final completion gage also was recorded last week for Rimrock-Tidelands, Inc.'s, Wilcox discovery well, 1-A U.S.A., in the southeast corner of the county. Flow was 112 bbl. of 40°-gravity oil per day through ⅛-in. choke. Pay is at 6,654-55 ft. with total depth at 7,021 ft.

This field has been named for Beaver Branch, a small stream near the discovery well. Location is near the Wilkinson County line, and about 1¾ miles north of Ireland field, in that county.

GREAT LAKES

MICHIGAN

Reynolds Field Well Flows Oil

New Reed City 1 Dundee, oil producer on the southwest side of the Reynolds field, Montcalm County, flowed 20 bbl. of oil in 20 minutes immediately after pay was topper. Previously, the direct east 40-acre offset, which is offset both to the north, south, and southeast with natural-flowing oil wells, drilled pay objective low and dry.

New producer was Robert Bond 2 Halliday, SE SE SE 12-12n-10w, Reynolds Township. Pay was topped at about the normal interval below Dundee top—below 101 ft., but exact depth was not known at this writing. Dundee top was logged at 3,227 ft.

The surprising and disappointing inside location that was drilled out dry was Swan-King, Basin, and G. Ackerman 2 Schnick, SE SW SW, 7-12n-9w, Winfield Township. Porosity zone was from 9-21 ft. lower than offsetting producing wells. Top of Dundee was logged at 3,242 ft. Hole was drilled to 3,367 ft. total depth.

Long string of 5-in. casing was cemented in at 5,112 ft. at Sun Oil Co. 1 Linaberry, NE NW SE 10-13n-2w, new Richfield oil showing wildcat, Grout Township, Gladwin County, and porosity sections, about 17 ft. logged between 5,023-81 ft., will be perforated and tested. Hole was bottomed out 5,228 ft. On the basis of core analysis of Richfield section, the 1 Linaberry is expected to be completed as Michigan's newest oil discovery well—first Richfield discovery for the year.

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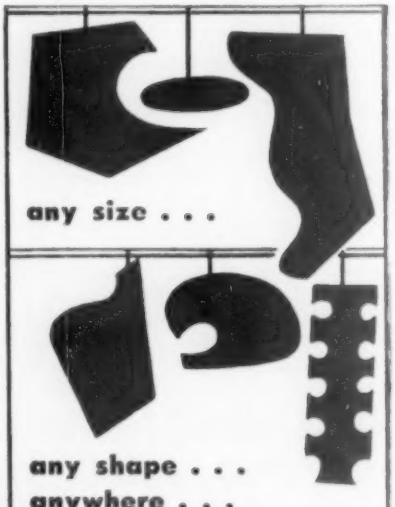

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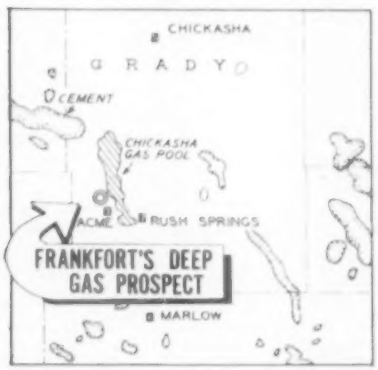
MID-CONTINENT

OKLAHOMA

Grady County Wildcat Has Gas Flow at Record Depth

Frankfort Oil Co. 1 Pruitt, NE NW 16-4n-8w, deep wildcat on the west flank of the Chickasha gas pool in Grady County, flowed gas at the daily rate of 6,900 M.c.f. on a drill-stem test of the lower Springer at 17,300-82 ft. This depth is 2,000 ft. greater than the state's present deepest production.

Operators drilled into the Springer sand at 15,172 ft., then tested open hole after drilling to 17,382 ft. Drilling continued below 17,666 ft.



Frankford Oil Co. 1 Pruitt, deep wildcat in Grady County.

The state's present depth record for producing wells in British American Oil Producting Co. 2 Harrison, a gas-distillate well in the shallow Knox pool in Grady County. Production there is in the third Bromide sand at 15,250-15,310 ft. Initial flowing pressure on the test was 7,825 psi., increasing to 11,400 psi. when set in. Operators set 7-in. casing at 17,361 ft.

Southwest of Cement field, in Caddo County, Frankfort 1 Blackbear, 9-5n-10w, was drilling below 16,627 ft.

Harper County . . . Woods Petroleum Co. 1 Seevers, 6-27n-20w, prospective discovery east of Buffalo, ran casing to total depth 7,625 ft. This well recovered 60 ft. of oil and 75 ft. of oil-cut mud on a test of the Oswego at 5,410-88 ft. A test of the Viola lime at 6,969-7,023 ft. flowed gas at the rate of 7,500 M.c.f. daily and recovered distillate-cut mud. Top of the Arbuckle was 7,415 ft.

HUGOTON EMBAYMENT

TEXAS PANHANDLE

Morrow Sand Discovery Completed in Hansford

Sharples Oil Corp. has completed its 1-B Bivins as an upper Morrow sand discovery, flowing 640 bbl. of oil a day through ½-in. choke.

Location of the well is in northwestern Hansford County, 10½ miles northwest of Gruver, in Section 107, Block 2, GH&H Survey, 2 miles south of gas production.

Operators reported sample top on the Morrow sand at 6,636 ft. Final gage of 640 bbl. was calculated from an 8-hour test through perforations at 6,638-54 ft.

OKLAHOMA PANHANDLE

Texas County Discovery Makes Heavy Oil Flow

Panhandle Eastern Pipeline Co. has completed its 0-1 Fletcher in Texas County as a good flowing well. Potential was 3,212 bbl. of oil, plus 5,610 M.c.f. of gas a day from Morrow sand at 6,256-96 ft.

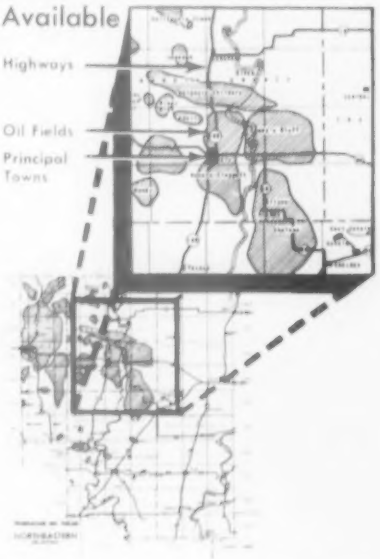
Location of the well in SW NE 14-3n-17eCM is 1 mile southwest of Musgrove Petroleum Co. 2-18 Enns, a Morrow gas discovery in Hugoton field. On elevation of 2,871 ft., the Fletcher well had the Morrow sand at 6,254 ft. and the Mississippian at 6,666 ft.

Beaver County Discovery Shut In After Flow Test

White Eagle Oil Co. and Shell Oil Co. have shut in their 1 A. C. Baldwin, Missouri sand discovery in 30-1n-26eCM, 8 miles south of Holland in Beaver County. Flow tests on perforations at 5,984-6,016 ft. gaged 364 bbl.

OKLAHOMA

New Oil Field Maps Available



Detailed maps of 11 producing districts covering Oklahoma are now available from MARKET RESEARCH GUIDE, 202 Midco Bldg., Tulsa, Oklahoma. These maps include oil fields, highways and principal towns. Write for complete information.

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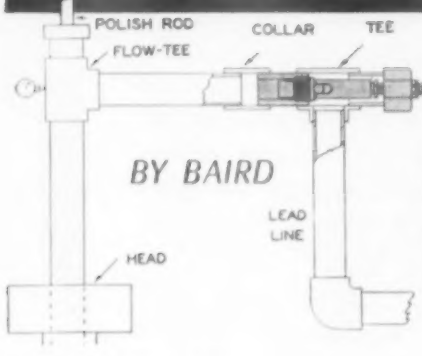

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of 38° oil in 16 hours. Total depth is 8,632 ft.

NORTH TEXAS

Grayson County Strawn Strike Is Completed

Nortex Oil & Gas Co. 1 J. K. Crossman, T. Toby Survey, has been completed for a daily potential of 182.5 bbl. a day from Strawn pay at 6,513-25 ft. Location is 2 miles south of Sandusky, and northwest of production.

Wise County . . . K & H Operating Co. and Christie, Mitchell & Mitchell 1 John Wilkinson has been completed as a conglomerate discovery. Location is 1 mile east of Grafton in the northwestern corner of the county. On potential test the well flowed 148.45 bbl. of 40° oil through 14/64-in. choke. Tubing pressure was 440 psi. and gas-oil ratio was 600:1. Pay was perforated between 5,741-76 ft.

Location is in the John Richie Survey, A-717. Suggested new field name is Crafton (5,740-ft. conglomerate).

Taylor County Flippen discovery . . . Potential has been filed for a Flippen sand discovery 10 miles south of Abilene in Taylor County. The well is F. C. Lattner et al 1 Henson, Section 9, Block 1, SP Survey. The well made a flowing potential of 154 bbl. of 42° oil through ½-in. choke, from pay at 2,102-08 ft. Location is 1 mile north of similar production in Cedar Gap field.

Montague County opener . . . Joseph A. Kovac 1 Nora Cobb, 7 miles north of St. Jo, has been completed on the pump for 62.5 bbl. of 40° oil a day. Pay was the Strawn at 2,418-23 ft.

Shackelford County Gets New Well in Lake Sand

Lion Oil Co. has completed as a discovery oil well its 1 Oma in Shackelford County. The new well is located in Section 46, Bayland Orphan Asylum Survey, about 3 miles southeast of Sedwick field.

The well was perforated in the Lake sand from 3,805-11 ft. On potential test, it flowed 188 bbl. daily of 37.7°-gravity oil, with no water, through a 14/64-in. choke. Gas oil ratio was 600:1.

Lion Oil owns leases on approximately 800 acres in the vicinity.

WESTERN KANSAS

Gas Discovery in Wallace County Stirs Interest

A wildcat gasser 75 miles northwest of the big Hugoton gas field has made a heavy flow of gas on drill-stem test. The well is Skelly Oil Co. 1 Sexson, 19-13s-42w, Wallace County.

Operators topped the Morrow shale at 4,994 ft., and Morrow sand at 5,008 ft. First gas flow came on a drill-stem test at 4,994-5,015 ft. Gas surfaced in 3 minutes at the rate of 5,210 M.c.f. per day. Twenty-minute shut-in pressure was 1,065 psi.

Another test, covering the interval at 4,944-5,040 ft., open 1½ hours, flowed gas at the rate of 5,200 M.c.f. per day. Shut-in pressure was 1,079 psi.

Operators drilled ahead, shooting for the Arbuckle. Top of the Mississippian was picked at 5,151 ft., and a drill-stem test in that formation, at 5,144-87 ft., had no pressures and recovered only 2 ft. of gas-cut mud.

Location of the wildcat is about 14 miles west of Sharon Springs, and near the Colorado border. Speculation that the well compares with gas wells in the Hugoton field has stimulated leasing interest.

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SOUTH TEXAS

TEXAS GULF COAST

Taft Area Wildcat Shows For New-Field Discovery

B. B. Warren and associates have a prospective new oil-discovery well in a wildcat test they are drilling 4 miles northeast of Taft, in San Patricio County, central coastal area.

The wildcat, 1 Stiba, in Section 23, filled 5,450 ft. of clean oil in a drill-stem test in Frio sand at 5,590-94 ft. Recovery was through ¼-in. top and bottom chokes. Working pressure was 250 psi. Bottom-hole pressure was 2,700 psi.

After deepening to 5,599 ft., operators have run casing through the indicated pay zone, and will perforate to complete.

New Pay Opened at Cody

Morgan Minerals Corp. has a new-pay discovery in the Cody area 2 miles southwest of Clarkwood, east of Corpus Christi, in Nueces County. The discovery is in its 7-A Cody estate, completed in pay at 4,178-86 ft. flowing at the rate of 135.22 bbl. of oil per day through 9/64-in. choke. Previous production has been from a 4,300-ft. Frio zone. Morgan's new well was drilled to 4,344 ft.

Large Gas Flow Credited To Chocolate Bayou Well

One of the largest gas flows yet recorded in any well in the big Chocolate Bayou field, Brazoria County, is credited to Phillips Petroleum Co.'s newly completed producer on its Gewil (R. K. Wilson Fee) lease, in the A. G. Reynolds Survey.

The well (No. 2) is rated good for 255,000,000 cu. ft. of gas per day, open flow. The gas yields 45.2°-gravity condensate in the ratio of 19,600 cu. ft. per barrel. Flowing pressure hit 7,695 psi.

Completion is from perforated interval at 11,921-38 ft. Hole was drilled to 12,000 ft.

SOUTHWEST TEXAS

Edwards Lime Produces In Weigang Deep Test

Testing continues at Lone Star Producing Co.'s significant deep Edwards lime discovery well northwest of Fashing, in the Weigang area, eastern Atascosa County.

Latest reported test, through 11/32-in. choke, recorded a flow-rate of 9,450,000 cu. ft. of gas per day with top pressure of 3,726 psi. and bottom-hoel pressure of 5,162 psi. Fluid recovery (51.6°-gravity condensate) was at the rate of more than 15 bbl. per 1,000,000 cu. ft.

The well, 1-A Urbanczyk, is testing the Edwards with perforations at 10,420-30 ft. Top of the Edwards was logged at 10,221 ft.

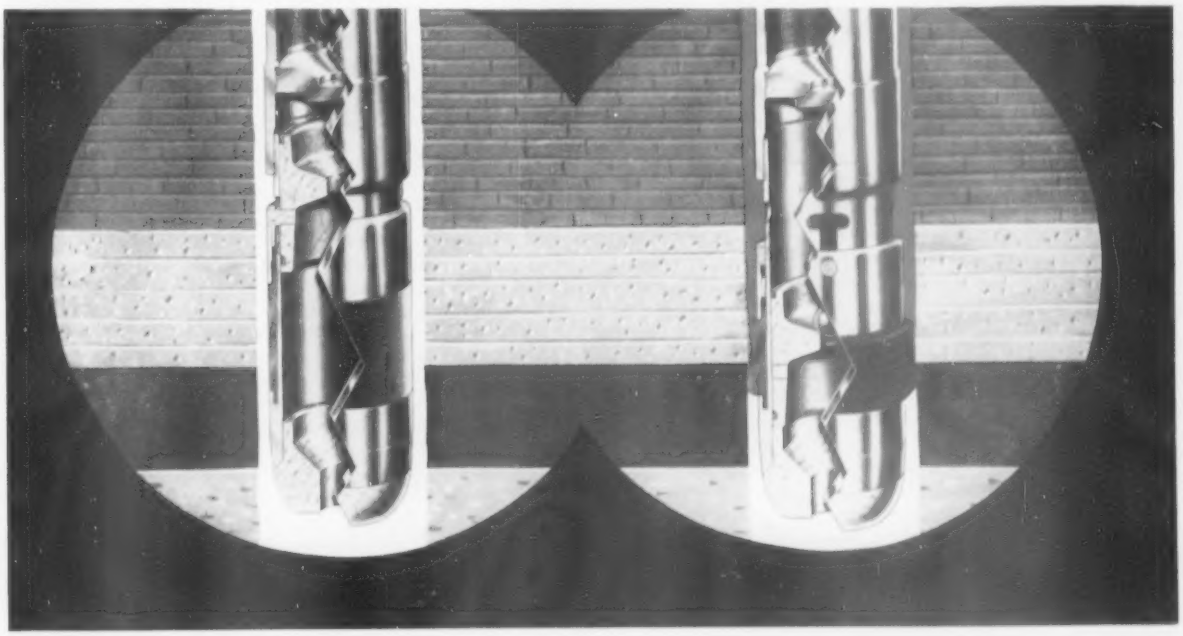
Location of the well is just northwest of the old, shallow Carrizo-Wilcox producing area at Weigang.

SOUTH LOUISIANA

Good Oil Flow Reported at Alligator Pass Discovery

Testing is under way at Continental Oil Co.'s deep, prospective oil-discovery well in the Alligator Pass area, south of Delacroix, 20 miles southeast of New Orleans, in Plaquemines Parish.

The indicated discovery well, 1 Delacroix, was drilled to 12,106 ft., and with casing bottomed at 12,100 ft., is



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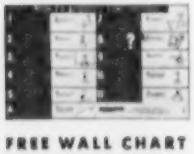

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R-P&C valves

perforated in three intervals from 11,494 to 11,598 ft.

While cleaning it was reported to have flowed large quantities of oil although no gages or estimates of productivity had been made as this is written.

Intervals perforated are 11,494-11,503 ft., 11,530-34 ft., and 11,590-98 ft.

Location of the well, in 16-15s-14e, is more than 2 miles north of Delacroix field.

Second Field Opened in West Lake Pontchartrain

Humble Oil & Refining Co.'s new discovery well in Lake Pontchartrain produced at the rate of 60.24 bbl. of 36.2°-gravity oil and 1,611,000 cu. ft. of gas per day during its final completion gage. Flow was through ⅝-in. choke with pressure of 2,500 psi. Total production cut 8 per cent water. Pay, in hole drilled to 10,000 ft., is perforated at 7,488-92 ft.

The discovery, in Tract 41, off the Jefferson Parish shore, opens the second field in the southwestern portion of the lake. It is 5 miles east of the first field, opened last May by Shell Oil Co. in Tract 36, off the St. Charles Parish shore. Shell now is completing its third well.

Humble's discovery is about 15 miles northwest of New Orleans.

Camerina Oil Discovery Indicated at Hackberry

Indications of production from the prolific lower Frio-Camerina zone are given in a discovery by Michel T. Halbouty and Hurt Oil Co., Ltd., at West Hackberry, on the west shore of Calcasieu Lake, in northern Cameron Parish.

The Halbouty-Hurt discovery is in their 1 Gulf-Noble & Buyers Unit, a step-out test off the southeast flank of the dome, where first production was opened in shallower horizons early in 1927. It is south of several old abandoned shallow oil-producers on that side of the dome.

Their well, a 50-50 ownership, logged oil saturation in Camerina sand at 5,845-5,900 ft. and 5,910-90 ft. Hole was deepened to 7,110 ft., and now has casing run through the prospective pay to 6,100 ft.

Cow Pen Creek Spreads

Production in the Cow Pen Creek area, of Beauregard Parish, is being extended northeastward with a new outpost completion by H. L. Hunt at his 2 McFatter-Hodges. Completion is

from perforated interval at 6,876-80 ft. with flow rate of 114 bbl. of 44.6°-gravity oil per day through ⅛-in. choke. Flowing pressure is 1,800 psi., and gas-oil ratio 930 cu. ft. per barrel.

Pointe-a-la-Hache Area Gets New Deep Producer

Richardson & Bass are following their discovery last June of new deep oil production in the Pointe-a-la-Hache area, on the east bank of the Mississippi River, 30 miles southeast of New Orleans, in Plaquemines Parish, with another deep producer, their 1-E Humble-Livaudais et al, Unit B.

The new well is just northeast of the first well, and between it and Pointe-a-la-Hache field, 2 miles northeast. It is completed for 114 bbl. of 26°-gravity oil per day, flowing through ⅛-in. choke with pressure of 850 psi. and gas-oil ratio of 763 cu. ft. per bbl. Pay is perforated at 10,796-10,805 ft.

Their first well, 2 Humble-Continental-State Lease 2513 (Mississippi River), was good for 99 bbl. of 25.6°-gravity oil per day through 17/64-in. choke from perforations at 10,758-65 ft.

WESTERN CANADA

ALBERTA

A venture in the Tempest railpoint area of southern Alberta, 12 miles east of Lethbridge city limits has yielded oil from the Madison formation during drill-stem operations carried out recently. The well was drilled by the team of Bow Valley Oil & Gas, Ltd., Mill Creek Oils, Ltd., and Thunderbird Minerals on farmout acreage acquired from the California Standard Co.

This new strike, Bow Valley, et al.-Tempest 4-27, on LSD 4, 27-9-19w4, lies 14 miles northeast of Mobil Oil of Canada, Ltd.'s Wilson 32-12 oil well and is 2½ miles northwest of Imperial Oil, Ltd.'s Tempest 2 exploratory dry hole.

During a drill-stem test around the 3,550-ft. level, a maximum gas flow of 260,000 cu. ft. daily was recorded. When pipe was pulled it was found to contain 1,000 ft. of 28° oil, no water.

Production casing has been run and the team will attempt completion at total depth, 3,554, which was also bottom of the discovery test.

Richfield Oil Corp. of California's Medicine River 7-32 southwest Alberta wildcat that is being drilled on Hudson's Bay Oil & Gas Co., Ltd., farmout rights yielded a very encouraging light gray oil show during a drill-stem test which straddled the base of the basal quartz formation and the top of the Rundle (Mississippian) horizon. This wildcat on LSD 7, 32-39-3w5, is 5½ miles north of Devonian oil production in the Hespero area 7 miles south of the West Gilby Viking sand zone oil pool and 11½ miles southwest of Bentley oil field.

Drill-stem test to indicate discovery was run of the interval 7,035-58 ft. There was a good initial air blow which was followed by gas to surface in 40 minutes at rate too small to measure. The drill-stem started to unload when there was 715 ft. still in the hole. It was therefore determined that recovery consisted of 710 ft. of oil and 5 ft. of oil-cut mud.

SASKATCHEWAN

Discovery Oil Indicated In North Carnduff Area

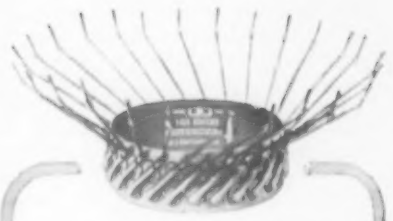
A team headed by Husky Oil & Refining, Ltd., and including Consolidated Mic Mac Oils, Ltd., has indicated a major oil find in southeast Saskatchewan at its sixth venture in a current 25-well exploratory project located on farmout lands from Canadian Superior Oil of California, Ltd. The new well lies in the North Carnduff district, 5 miles southwest of the present proved limits of the Nottingham oil field and 55 miles east-northeast of Estevan.

During two tests, which indicated a pay thickness of 50 ft. in the Mission Canyon member of the Mississippian, recoveries of up to 2,400 ft. of oil were made.

The well, Husky-Mic Mac-Canadian Superior 1 North Carnduff, on LSD 16, 30-3-32w1, topped the Mission Canyon zone at 3,758 ft. Initial test, covering a 53-ft. interval and bottomed at 3,823 ft., encountered 1,200 ft. of clean oil and 1,200 ft. of gassy, mud-cut oil. The next drill-stem test, immediately below the first, recovered 1,340 ft. of oil and gas-cut mud and 1,480 ft. of oil-cut salt water.

Tests and cores taken indicate a productive section of over 50 ft. in the well.

Under the terms of the farmout agreement, Husky and Mic Mac will earn 50 per cent interest in a total of 20,480 acres of freehold leases which lie on the trends of recent discoveries throughout the southeast Saskatchewan area. The team will drill one exploratory well on each of the 25 blocks of acreage covered by the agreement. Additional acreage has been acquired in areas adjacent to those included in the farmout. North Carnduff No. 1 is one of six wells drilled to date under the



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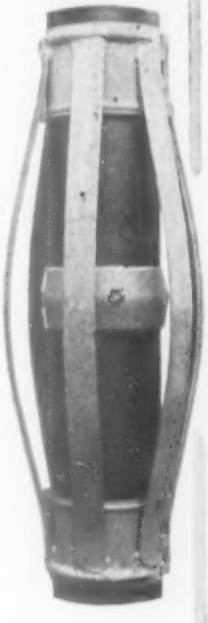

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program. Three previous wells have recorded significant oil shows but were not considered capable of commercial production.

North Carnduff No. 1 is now drilling ahead and will test another horizon of the Mission Canyon formation. Casing will be set and perforated for production following the tests of the deeper zone.

Crew of the Husky-owned rig, one of three being used on this project, ran production casing and prepared the hole for production tests.

Imperial Oil, Ltd., reported during the past week that its South Queensville 3-26, and Imperial Poplar 13-55, wildcats situated in the southeastern sector of Saskatchewan, and the Hernefield 1-30 exploratory venture that it is drilling with the California Standard Co. in the Waskada area of southwest Manitoba, have all indicated oil production in the Mississippian formation.

South Queensville 3-26, LSD 3, 26-5-2w2, is logging at 4,506 ft., after indicating an oil column in the Mission Canyon zone. Drill-stem operations gave up oil-cut mud and salt water from the formation and casing is currently being run in order to fully evaluate the structure.

Poplar 13-35, LSD 13, 35-2-1w2, has reached total depth of 4,670 ft., production casing is in the hole and the operator is currently waiting for a service rig to complete the hole. During a series of drill-stem tests at this hole, run in the Charles zone, recoveries of up to 520 ft. of oil-water emulsion were made. Fifty per cent of that recovery was oil.

Discovery at the Hernefield 1-30, LSD 1, 30-1-25w1, was made in the Mission Canyon member and drill-stem tests encountererd oil and water.

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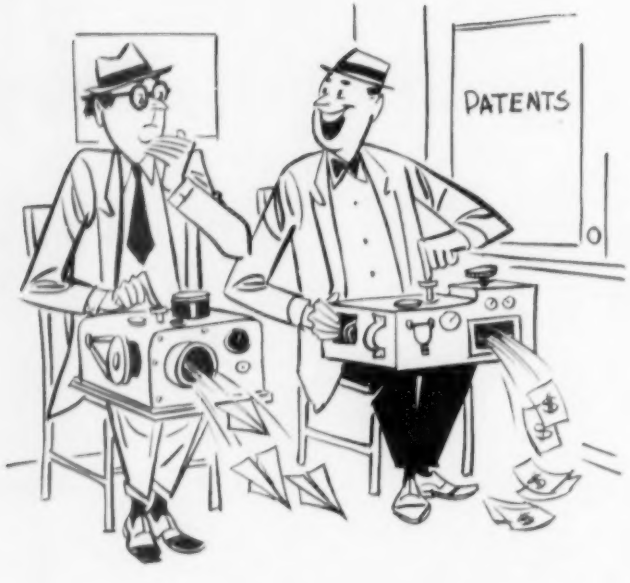

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APPALACHIAN

OHIO

A gas pool of some area in the center of Knox Township, Holmes County, is confirmed by the 1 Logan Kline, Section 14, ¾ mile north of the 1 Doty. Clinton sand at 3,270-84 ft. gaged 375,000 cu. ft. of gas natural and 2,350,000 cu. ft. after fracturing.

An extension or a new pool 1 mile east of the Cottage Hill field was found by Khan, Kernoodle and Katy on 1 H. Branson, Section 14, Hopewell Township, Muskingum County. Clinton was logged at 3,280-3,347 ft. with 350,000 cu. ft. of gas and a show of oil natural, and 1,400,000 cu. ft. of gas and 10 bbl. of oil in 24 hours after fracturing.

Summerlea, Inc., 1 O. S. Hazlett, Section 12, Hopewell Township, Perry County, ½ mile east of the 1 Campbell, found the Clinton at 2,907-40 ft. with 2 bbl. of oil natural and 50 bbl. in 24 hours after fracturing.

EASTERN KENTUCKY

On Buckhorn Creek in the Pike County sector of the Big Sandy gas field Columbian Fuel Corp. has completed its 1391 Rogers Brothers Coal Co. as a good Berea (Mississippian) gas well. Bottomed at 2,647 ft., the test gaged gas at the rate of 1,316,000 cu. ft. daily with a 2-day rock pressure recording of 564 lb.

SOUTHWEST PENNSYLVANIA

In Gaskill Township, Jefferson County, Southwest Pennsylvania, Columbian Carbon Co., et al., completed 1834 Harriett McClure wildcat, elevation 1,717 ft., gaging 1,812,000 cu. ft., gas after fracture, Chert 7,292 ft., gas 7,312 ft., Oriskany sand 7,362 ft., TD 7,400 ft. Mt. Pleasant Township, Westmoreland County, Peoples Natural Gas Co. 4100 Henry E. Leighty, is drilling at 4,094 ft.

● Union district, Grant County, West Virginia, Roger L. Glaze, has lo-

cated 1 J. B. Reese, et al., rank wildcat, elevation 3,285 ft., Davis Quadrangle. 2.17 miles south of latitude 39 degrees 15 minutes and 3.75 miles west of longitude 79 degrees 15 minutes. Licking district, Tucker County, Hope Natural Gas Co., 9993 E. Fike, encountered a gas pocket at 4,800 ft., in the Oriskany sand gaging 905,000 cu. ft., blowing down to 231,000 cu. ft. Drilling is at 4,817 ft.

Successful Wildcats

CALIFORNIA

Glenn County: The Texas Co. 2 Benamati, SW SW 4-19n-2w, 1,127 M.c.f. daily, $\frac{7}{8}$-in. choke, perfs. 4,745-65 ft., TD 7,204 ft. (New gas pool discovery in Beehive Bend field.)

ILLINOIS

Saline Couny: Skiles Oil Corp. 2 W. F. Johnson, SW SW SW 20-9s-7e. IP 15 BOPD, "C" sand 2,260-2,300 ft., "B" sand 2,358-76 ft. TD 2,604 ft.

MISSISSIPPI

Adams County: John S. Callon 1-P Armstrong, 16-5n-3w. IP 104 BOPD, $\frac{1}{8}$-in., 40°, perforations 6,280-82 ft. (Wilcox-McKittrick). TD 6,709 ft. Elev. 57 ft., Wilcox 4,440 ft., base Big shale 5,784 ft., McKittrick 6,280 ft., Minter equivalent 6,599 ft. (Discovery well Butler Lake field.)

Rimrock-Tidelands, Inc., 1-A U.S.A., 31-5n-1w. IP 112 BOPD, $\frac{1}{8}$-in., 40°, perforations 6,654-55 ft. (Wilcox). TD 7,021 ft. Elev. 114 ft., Wilcox 4,591 ft., base Baker shale 6,364 ft., Baker sand 6,432 ft. (Discovery well Beaver Branch field.)

EAST TEXAS

Anderson County: The Texas Co. 2 E. C. Williams, J. N. Acosta Sur., A-1, 7 mi. NW Tennessee Colony. IPP 10 BOPD, GOR zero, 28°, Woodbine 5,622-27 ft. TD 6,101 ft., elev. 350 ft.

NORTH TEXAS

Grayson County: Charta Oil Corp. 1 Allen estate, J. C. Henderson Sur., A-1541, 2 mi. NW Whitesboro. IP 187 BOPD, 12/64-in., TP 495 psi., GOR 67, 29.8°, pay 5,694-5,702 ft. TD 5,758 ft.

Knox County: Glenn W. Cooper 1 Coffman, 83-45-H&TC, ¼ mi. E Goree. IPP 47.6 BOPD, 37°, GOR 200, pay 1,668-73 ft. TD 1,755 ft.

Texoma Drilling Co. 1 Cartwright, Sec. 73, A-139, H&TC Sur., 1 mi. NE Goree. IPP 47 BOPD, 41°, GOR 500, pay 1,659-64 ft. TD 1,810 ft.

Wichita Pipe & Supply Co. 1 Coffman, 83-45-H&TC, ¾ mi. SE Goree. IP 110 BOPD, ¼-in., 125 psi., 36°, GOR 150, pay 1,728-37 ft. TD 1,781 ft.

SOUTHWEST TEXAS

Jim Wells County: J. A. Kimmey 4 Muil, Share 3-2A, Los Presenos de Abajo Grant, A-171. IP 106.64 BOPD, 9/64-in.,

Jim Hogg County: Gorman-Gerhart-Howe 4-B East, A. V. Prado Sur. 42, A-253, IP BOPD, 9/64-in., 39.6°, perforations 3,743-48 ft. TD 3,749 ft. (New pay in Prado field.)

TEXAS GULF COAST

Bee County: Edwin L. Cox and F. B. Cochran, Jr., 1 Allan Shivers, Sec. 104 (1 mile northeast of Tynan). IP 321.57 BOPD, 5/32-in., 24°, perforations 4,349½-51½ ft. TD 5,115 ft. (New field.)

Harris County: Humble Oil & Refining Co. 24 West, A/C 3, Luke Hemenway Sur., A-802. IP 610.53 BOPD, ¼-in., 36.9°, perforations 7,646-68 ft. (Vicksburg). TD 10,450 ft. (New pay in Webster-Friendswood area—previous production from Frio.)

San Patricio County: Plymouth Oil Co. 1 Cockerham, Tract 5, Mrs. L. A. Rogers Sur. (5 miles west of Sinton). IP 37.28 BOPD, 9/64-in., 33°, perforations 5,784-89 ft. TD 6,352 ft. (New field—Cockerham.)

WEST TEXAS

Andrews County: The Texas Co. 1 University "BL," 34-6-University Sur., 20 mi. E Andrews. IPP 197 BOPD, 45°, Devonian perforations 12,548-63 ft. TD 12,565 ft., elev. 3,003 ft.

Crane County: Gulf Oil Corp. 380 Waddell, 14-B27-PSL, 20 mi. NW Crane. IP 142 BOPD, 12/64-in., TP 1880 psi., GOR 3792, 38°, Tubb 5,948-55 ft. TD 6,175 ft., elev. 2,496 ft. ground.

Ector County: Sunray Mid-Continent Oil Co. 1 Ector County Airport, 46-42-T1S-T&P, 4 mi. N Odessa. IPP 63 BOPD, 35°, GOR 2677, Pennsylvanian 9,838-48 ft. TD 13,905 ft., PB 9,870 ft., elev. 2,979 ft.

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28.6°, perforations 4,068-82 ft. TD 4,119 ft. (New pay in Captain Lucey field.)

WEST CENTRAL TEXAS

Callahan County: Callihan Interests et al 1-A Caldwell, 14-5-SPRR Sur., 10 mi. SW Putnam. IP 184 BOPD, 40°, TP 200 psi., GOR 550, Jennings sand 2,824-29 ft. TD 3,296 ft.

Taylor County: Ambassador Oil Corp. 1 Hugs, Wm. B. Hardin Sur. 130, 8 mi. SW Abilene. IP 305 BOPD, ¼-in., TP 300 psi., GOR 626, 39°, Morris sand 4,150-58, 4,162-69 ft. TD 4,300 ft., ground elev. 1,821 ft.

OKLAHOMA

Cleveland County: An-Son Petroleum Co. 1 Hoover, NW SE 21-10n-3w. IP 57 BOPD, 40°, 12/64-in., pay 7,892-7,919 ft. TD 8,005 ft.

Osage County: W. R. Dillard No. 1, NE NE SW 11-27n-7e. IPP 75 BOPD, 38°, pay 2,491-2,503 ft. TD 2,873 ft.

PENNSYLVANIA

Jefferson County: Columbian Carbon Co., et al. 1834 Harriett McClure et al., wildcat, elevation 1,717 ft., 1,812,000 cu. ft., gas after fracture, chert 7,292 ft., gas 7,312 ft., Oriskany sand, 7,362 ft., TD 7,400 ft.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. By virtue of the authority vested in the President and pursuant to Executive Order No. 10355 of May 26, 1952, and Public Land Order 1298 of May 4, 1956, notice is hereby given that 492.51 acres of land including parts of Secs. 3 and 12 in the University Leagues Subdivision, Blocks 1, 11, 15, and 16, in Grayson County, Texas, situated within the Perrin Air Force Base, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.D.T., on August 29, 1956. Details of the lease offer, copies of the lease agreement with plat of lease area and special stipulations as to use and protection of the property and drilling requirements and bid forms may be obtained from the Oil and Gas Supervisors of the Geological Survey at 239 Federal Building, Tulsa, Oklahoma, and at 333 St. Charles Avenue, New Orleans 12, Louisiana; the Commander of the Perrin Air Force Base, Sherman, Texas; or the Washington office of the Bureau of Land Management, or the Land Office at Santa Fe, New Mexico. L. E. Hoffman, Minerals Staff Officer.

LEGAL

NOTICE OF SALE NO. 7 OF OIL AND GAS MINING LEASE RESTRICTED INDIAN LAND

DEPARTMENT OF THE INTERIOR BUREAU OF INDIAN AFFAIRS CROW INDIAN AGENCY CROW AGENCY, MONTANA

SEALED BIDS will be received until 2:00 P.M. Mountain Standard Time, **August 29, 1956**, and opened at that time in the office of the Superintendent of the Crow Indian Agency, Crow Agency, Montana, for the leasing of Units of restricted Indian Lands comprising **26,390.97** acres of land where the mineral rights are reserved for the benefit of the Crow Tribe by the Act of June 4, 1920, (41 Stat. 751-753), lands described on the attached sheets, located in Treasure and Big Horn County, Montana for oil and gas mining purposes. The sale will be conducted under regulations of the Secretary of the Interior, Title 25, CFR 195 (Act of June 4, 1920, 41 Stat. 751-753). Each unit to be bid on separately. The right is reserved to reject any and all bids and to disapprove any lease submitted on an accepted bid. The units of land are being offered subject to the approval of the Crow Tribal Council, and a separate lease will be drawn on the applicable forms for each unit. Should any bid be rejected or lease disapproved through no fault of the bidder, all deposits shall be returned to the bidder. The lease on lands to which minerals are reserved for the benefit of the Crow Tribe, Act of June 4, 1920 (41 Stat. 751-753) will be for a period of 10 years, from date of approval by the Secretary of the Interior or his authorized representative, with the right of renewal for an additional period to and including **June 3, 1970**, upon such terms and conditions as the Secretary of the Interior may prescribe and by showing to the satisfaction of the Secretary of the Interior that the leased premises are then producing oil or gas in paying quantities, provided, that any extension of any renewal lease beyond June 3, 1970, shall not be effective unless before that date such extension shall have been ratified by the Congress. Subject to the foregoing, leases will be sold to the bidder who offers the highest money bonus upon a per acre basis. Conditional or alternate bids will not be considered. No drilling propositions will be considered as a part of the bonus offer. **Each bid must be accompanied by a deposit in an amount not less than 25 per cent of the bonus bid.** All deposits are to be made by certified check or bank draft on a solvent bank, made payable to the **Bureau of Indian Affairs. Sight drafts will not be accepted.** The successful bidder or bidders will be required to pay their proportionate share of the advertising costs. Deposits from unsuccessful bidders will be returned. In the event two or more bids are in the same amount and such bids are the high bids, the bidders submitting such bids may be required to draw lots to determine the successful bidder. **IMPORTANT NOTICE:** All successful bidders will be required to prepare their own leases. Leases will be drawn on approved forms (special form is required for leases on land where minerals are reserved for the benefit of the Crow Tribe). Forms may be obtained from the office of the Superintendent, Crow Indian Agency, Crow Agency, Montana. Within 30 days after notification of being the successful bidder, said bidder must remit the balance of the bonus, the first year's rental, and his share of the advertising costs, together with a filing fee of $5.00 for each lease, and shall file with the superintendent the lease in completed form. The Superintendent may, for good and sufficient reasons extend the time for the completion and submission of the lease form, but no extension shall be granted for remitting the balance of monies due. If the successful bidder fails to pay the full consideration within said period, or fails to file the completed lease within the said period or extension thereof, or if the lease is disapproved through no fault of the lessor or the Department of the Interior, 25 per cent of the bonus bid will be forfeited for the use and benefit of the Indian lessor. **BONDS:** (a) Lessee shall furnish with each lease a bond (Form 5-154b), with an acceptable company authorized to act as sole surety, or with two or more personal sureties and a deposit as collateral security of any public-debt obligations of the United States guaranteed as to principal and interest by the United States, equal to the full amount of such bonds, or other collateral satisfactory to the Secretary of the Interior, or show ownership of unencumbered real estate of the value equal to twice the amount of the bonds. Lessee may file a bond on Form 5-154a without sureties and a deposit as collateral security of Government bonds equal in value to the full amount of the bond. Lease bonds shall be in the following amounts: For less than 80 acres, $1,000; For 80 acres and less than 120 acres, $1,500; For 120 acres and not more than 160 acres, $2,000; For each additional 40 acres, or part thereof above 160 acres, $500. PROVIDED, That a lessee may file one bond (Form 5-154f), in the sum of $15,000 for all leases of minerals in any one State and which may also include leases on that part of an Indian reservation extending into States contiguous thereto, to which the lessee may become a party: PROVIDED FURTHER, That the total acreage covered by the bond shall not exceed 10,240 acres. (b) In lieu of the bonds required under paragraph (a) of this section, a lessee may furnish a bond (Form 5-156) in the sum of $75,000 for full nationwide coverage with an acceptable company authorized to act as sole surety to cover all oil and gas leases and oil and gas prospecting permits without geographic or acreage limitation to which the lessee or permittee is or may become a party. (c) The right is specifically reserved to increase the amount of bonds and the collateral security prescribed in paragraph (a) of this section in any particular case when the officer in charge deems it proper to do so. The nationwide bond may be increased at any time in the discretion of the Secretary of the Interior. The rate of royalty will be 12½ per cent on all leases. The rental of $1.25 per-acre paid for any one year will be credited on the royalty for that year. A charge of $1.00 will be made for each set of lease forms. The adequacy of the bonus offer will be considered by the United States Geological Survey. The responsibility of complying with any requirement of the Federal Documentary stamp statutes will be left with the successful lessee. In addition to all other remedies provided by law, failure of the successful bidder to comply with terms of the sale will render all deposits theretofore made by or due from him subject to forfeiture without further action on the part of this office. **Method of future payment of rental and/or royalty:** Payment on all approved Indian Oil and Gas Leases on lands located under the jurisdiction of this Agency should be made payable, when due, to the **Bureau of Indian Affairs** and transmitted to the Superintendent of the Crow Indian Agency, Crow Agency, Montana, THROUGH the Regional Oil and Gas Supervisor, U. S. Geological Survey, P. O. Box 400, Casper, Wyoming. All bids should be addressed to the Superintendent, Crow Indian Agency, Crow Agency, Montana, in a plain envelope marked "Bid for Oil and Gas Mining Lease, not to be opened until 2:00 P.M. Mountain Standard Time, **August 29, 1956.** Address all inquiries to: Superintendent, Crow Indian Agency, Crow Agency, Montana.

L. C. Lippert
Superintendent.

DATED: **July 25, 1956.**

MINERAL RIGHTS RESERVED FOR THE BENEFIT OF THE CROW TRIBE BY ACT OF JUNE 4, 1920 (41 Stat. 751-753)

Unit No.	Description	Section	Acreage
	Township 4 North, Range 35 East, P.M.M.		
No. 1	Lots 1,2,3,5,6,7,8,9,10,11,12,	3	451.47
No. 2	Lots 2,3,6,7,8,9,10,11,12, $N\frac{1}{2}SE\frac{1}{4}$, $SE\frac{1}{4}SE\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $NW\frac{1}{4}SW\frac{1}{4}$,	4	
	$NE\frac{1}{4}SE\frac{1}{4}$	5	
	$N\frac{1}{2}NW\frac{1}{4}$,	9	729.68
No. 3	$SW\frac{1}{4}SW\frac{1}{4}$,	8	40.00
No. 4	$N\frac{1}{2}$, $SE\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $SW\frac{1}{4}SW\frac{1}{4}$.	11	600.00
No. 5	$S\frac{1}{2}NE\frac{1}{4}$,	13	80.00
No. 6	$NW\frac{1}{4}NW\frac{1}{4}$,	13	
	$N\frac{1}{2}N\frac{1}{2}$, $SW\frac{1}{4}NW\frac{1}{4}$, $NW\frac{1}{4}SW\frac{1}{4}$,	14	
	$N\frac{1}{2}SE\frac{1}{4}$, $SE\frac{1}{4}SE\frac{1}{4}$, $NE\frac{1}{4}SW\frac{1}{4}$,	15	440.00
No. 7	$S\frac{1}{2}$, $NW\frac{1}{4}$, $SE\frac{1}{4}NE\frac{1}{4}$,	25	520.00
No. 8	$N\frac{1}{2}$, $SE\frac{1}{4}$, $N\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}SW\frac{1}{4}$,	26	
	$E\frac{1}{2}E\frac{1}{2}$, $SW\frac{1}{4}SE\frac{1}{4}$,	27	800.00
No. 9	$SE\frac{1}{4}NW\frac{1}{4}$, $NE\frac{1}{4}SW\frac{1}{4}$, $NW\frac{1}{4}SE\frac{1}{4}$.	29	120.00
	Township 5 North, Range 35 East, P.M.M.		
No. 10	Lots 1,2,3,4, $S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$	5	640.24
No. 11	Lots 1,2,3,4,5,6,7, $S\frac{1}{2}NE\frac{1}{4}$, $SE\frac{1}{4}NW\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}$,	6	633.95
No. 12	Lots 1,2, $E\frac{1}{2}NW\frac{1}{4}$, $E\frac{1}{2}$	7	477.04
No. 13	All	8	640.00
No. 14	$NW\frac{1}{4}$,	13	
	All	14	800.00
No. 15	All	17	640.00
No. 16	Lots 2,3,4, $SE\frac{1}{4}NW\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}$,	18	396.22
No. 17	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $E\frac{1}{2}$,	19	635.60
No. 18	$S\frac{1}{2}$, $NW\frac{1}{4}$, $S\frac{1}{2}NE\frac{1}{4}$,	20	560.00
No. 19	$N\frac{1}{2}$, $W\frac{1}{2}SW\frac{1}{4}$,	21	400.00
No. 20	$W\frac{1}{2}W\frac{1}{2}$,	24	160.00
	Township 5 North, Range 36 East, P.M.M.		
No. 21	$E\frac{1}{2}SE\frac{1}{4}$,	24	80.00
No. 22	$S\frac{1}{2}$,	26	320.00
No. 23	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $N\frac{1}{2}NE\frac{1}{4}$, $SE\frac{1}{4}NE\frac{1}{4}$, $S\frac{1}{2}SE\frac{1}{4}$, $NE\frac{1}{4}SE\frac{1}{4}$.	31	558.71
No. 24	$W\frac{1}{2}$, $S\frac{1}{2}SE\frac{1}{4}$.	32	400.00
No. 25	All	33	640.00
No. 26	All	34	640.00
No. 27	$S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$,	35	480.00
	Township 4 North, Range 36 East, P.M.M.		
No. 28	Lots 1,2,3,4,5,6,7,8,9,10,11, 12, $S\frac{1}{2}$,	1	806.84
No. 29	Lots 1,2,3,4,5,6,7,8,9,10,11, 12, $S\frac{1}{2}$,	2	806.64
No. 30	Lots 1,2,3,4,5,6,7,8, $S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$,	3	806.20
No. 31	Lots 1,3,4,5,6,8, $SE\frac{1}{4}$, $S\frac{1}{2}SW\frac{1}{4}$, $NW\frac{1}{4}SW\frac{1}{4}$,	4	525.21
No. 32	$S\frac{1}{2}N\frac{1}{2}$, $SW\frac{1}{4}$, $W\frac{1}{2}SE\frac{1}{4}$, $NE\frac{1}{4}SE\frac{1}{4}$.	5	440.00
No. 33	All	11	640.00
No. 34	$E\frac{1}{2}$, $SW\frac{1}{4}$.	13	480.00
No. 35	All	14	640.00
No. 36	$S\frac{1}{2}NE\frac{1}{4}$, $SE\frac{1}{4}NW\frac{1}{4}$, Lots 3,4, $E\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}$,	18	435.02
No. 37	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $E\frac{1}{2}$	19	631.60
No. 38	All	20	640.00
No. 39	All	21	640.00
No. 40	$N\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}NW\frac{1}{4}$,	22	240.00
No. 41	All	24	640.00
No. 42	All	27	640.00
No. 43	$SW\frac{1}{4}SW\frac{1}{4}$,	28	
	All	29	680.00
No. 44	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $E\frac{1}{2}$,	30	633.04
No. 45	Lots 1,2,3, $E\frac{1}{2}NW\frac{1}{4}$, $NE\frac{1}{4}SW\frac{1}{4}$, $NE\frac{1}{4}$,	31	394.75
	Township 5 North, Range 36 East, P.M.M.		
No. 46	Lots 1,2,3,4, $S\frac{1}{2}N\frac{1}{2}$,	3	319.36
No. 47	Lots 1,2,3,4, $S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$,	4	639.40
No. 48	$W\frac{1}{2}$, $W\frac{1}{2}SE\frac{1}{4}$,	20	400.00
No. 49	$E\frac{1}{2}$, $SW\frac{1}{4}$, $E\frac{1}{2}NW\frac{1}{4}$, $SW\frac{1}{4}NW\frac{1}{4}$, $S\frac{1}{2}NW\frac{1}{4}NW\frac{1}{4}$, $NE\frac{1}{4}NW\frac{1}{4}NW\frac{1}{4}$	22	630.00
No. 50	All	23	640.00
No. 51	$NW\frac{1}{4}SW\frac{1}{4}$, $S\frac{1}{2}S\frac{1}{2}$.	27	200.00
No. 52	$SW\frac{1}{4}NE\frac{1}{4}$, $NW\frac{1}{4}$, $NE\frac{1}{4}$, $NE\frac{1}{4}SE\frac{1}{4}$.	28	
		29	400.00
No. 53	$E\frac{1}{2}$, $SW\frac{1}{4}$, $E\frac{1}{2}NW\frac{1}{4}$, $SW\frac{1}{4}NW\frac{1}{4}$.	33	600.00
No. 54	All	34	640.00
	Township 7 South, Range 33 East, P.M.M.		
No. 55	$S\frac{1}{2}$.	29	320.00

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Aliquats*: These fatty quaternaries combine excellent corrosion inhibiting qualities with bactericidal activity. They are used in secondary oil recovery, circulating water systems and cutting oil formulations.

Alamacs*: These are water soluble or dispersible compounds made from primary amines. They are important as corrosion inhibitors.

Alamines*: This is a versatile group of primary and secondary fatty amines, excellent for preventing the formation of scale and deposits, and for inhibiting corrosion. Alamines may be dispersed in water with cationic and nonionic emulsifiers and are soluble in many organic solvents.

Diams*: These fatty trimethylene diamines are strongly alkaline and have high cationic activity. They are valuable in formulating corrosion inhibitors for crude oil production, transportation and storage. Their properties suggest many other interesting applications.

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KANKAKEE, ILLINOIS

On July 10, 1956 . . . The one millionth operation by Schlumberger was run on the Humble Oil and Refining Company's Danbury Gas Unit No. 6, Well No. 1 in the Danbury Field.

When Schlumberger introduced electrical well logging to oil operators in the United States in 1929, it was a radically new approach to oil exploration. It was almost unbelieveable that accurate information could be obtained in such a manner; but it could — and was — time after time.

The years between the first and the millionth operation in the United States have seen the Schlumberger organization expand to supply the needed service to a growing oil industry.

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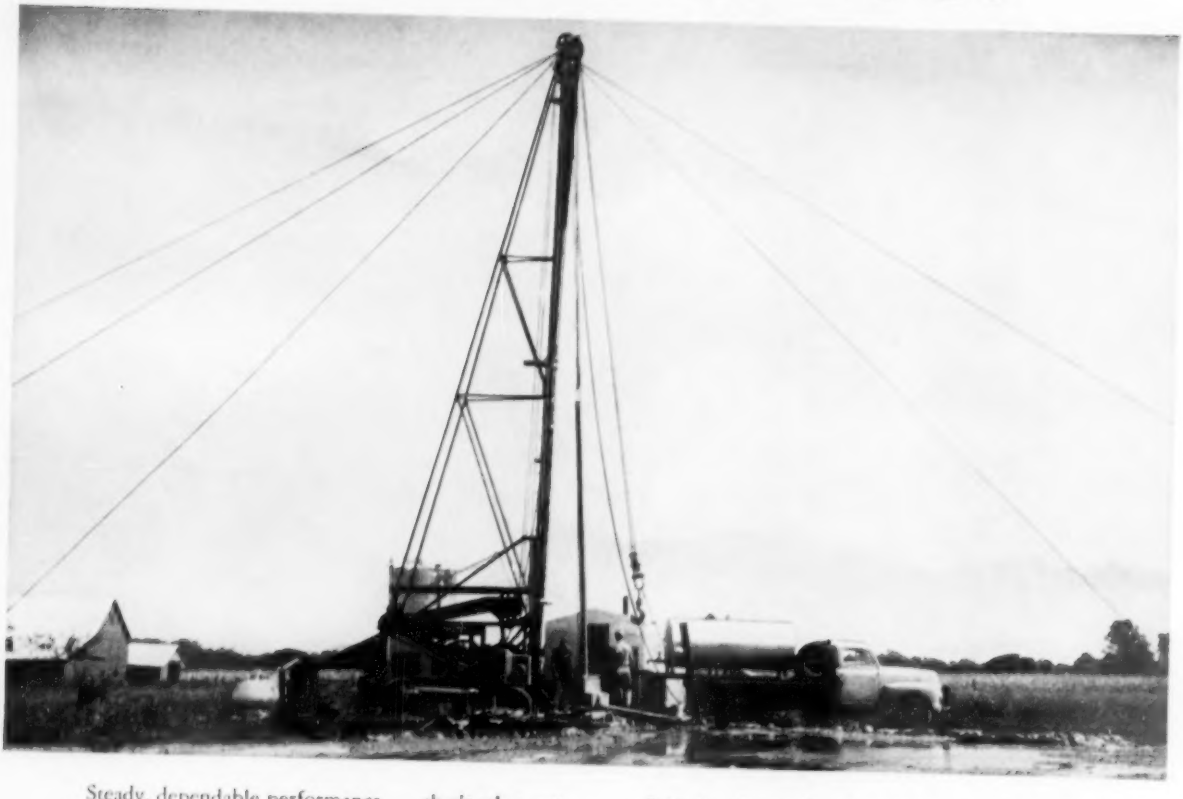
This experience earned in making a million operations is yours today when the familiar blue and white truck rolls up to your well. And the determination to pioneer — to improve — to excell — still dominates the Schlumberger organization just as it did one million operations ago.

SCHLUMBERGER
WELL SURVEYING CORPORATION

THE EYES OF THE OIL INDUSTRY

IT HAS BEEN DONE A MILLION TIMES

What's in it for YOU?



Steady, dependable performance . . . that's what you expect and get with a versatile Bucyrus-Erie spudder on your drilling and servicing operations. These modern mobile rigs speed top-to-bottom drilling, drilling-in, or the multiple jobs included under servicing and well completion. They are designed to assure pace-setting performance hole after hole with quick easy moves, and reduced costs all down the line. They are built to stand up to full-time diet of rugged duty.

Such outstanding dependability — the backbone of true satisfaction — is the result of Bucyrus-Erie's close attention to the little things through a skill born of pride and craftsmanship. At Bucyrus-Erie, *quality* comes FIRST — quality in design, in materials, in manufacture, in service.

60-L Top-to-bottom drilling to 1,500 ft.; Servicing to 2,000 ft.; Swings up to 2,750 lbs. of tools.

28-L Top-to-bottom drilling to 2,500 ft.; Servicing to 3,000 ft.; Swings up to 3,700 lbs. of tools.

36-L Top-to-bottom drilling to 3,500 ft.; Servicing to 4,000 ft.; Swings up to 5,000 lbs. of tools.

48-L Top-to-bottom drilling to 6,000 ft.; Servicing to 7,000 ft.; Swings up to 6,700 lbs. of tools.

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When Kidd returned to Bartlesville . . .

. . . It Was Like a Coronation

IT was a bewildered youth who walked onto the campus of Indiana University back in 1919 and "signed in" as Robert L. Kidd, Brazil, Ind.

He had a vague notion that he wanted to become a medical doctor and an even vaguer notion of how to go about it.

"I arrived the day before school started," he recalls, "I was rushed for time, I didn't know what subjects to take, and there were no advisors to help in those days. I was thoroughly confused."

But that was a state of mind which obviously hasn't been much of a problem since. He was recently named president of Cities Service Oil Co. (Del.), after a steady rise in the organization since 1925.

As a matter of fact, Kidd's confusion ended soon after he was enrolled for his first year in college. His roommate, in the Phi Kappa Psi fraternity house, was a senior geology student whose frequent field trips, sizable rock collection, and hearty enthusiasm soon swayed Kidd's thinking.

Birth of a "rock hound" . . . It was the beginning of the end for his medical studies and the start of his career as a "rock hound."

Kidd's roommate was later responsible for his joining Cities Service. Kidd visited him in the Southwest about 2 years after graduation and stayed on as a geologist for the company he now heads.

The roommate who played such an important role in Kidd's career was Dr. John R. Reeves, now president of Dominion Natural Gas Co. of New York, another Cities Service Co. subsidiary.

Kidd, who was described by the man who hired him as "an unusual combination of scientist, student, and executive," is responsible for a number of firsts with the company and the industry.

He shies away from personal kudos with the quick reminder that "a single individual is seldom, if ever, wholly responsible for developments in the oil industry." But he is credited with pioneering research that established the first program of oil finding with geophysics at Cities Service. This was in 1933.

Kidd played a leading role in the company's pioneering of underground storage of natural gas. He conducted the early geological surveys which led to the first full-scale project of this type in the oil industry.

Another pioneering move by the company also received help from Kidd, this time in the field of secondary recovery. He worked on the early-day injection programs in El Dorado field, using a compressed-air drive to recover oil from the shallow sands. The "air flood" was effective, but it has long since given way to other methods.

Personals

Backs C.A.T.C. . . . One of the high spots in Kidd's career involves the C.A.T.C. Group. The offshore exploration unit was started when Kidd was vice president of Cities Service Oil Co. and he was instrumental in bringing his firm into the venture.

As he describes it, it was the means of pooling the efforts of four companies to "share the expense and share the risk." The C.A.T.C. Group observed its tenth birthday last month. It is probably the most successful unit of its kind.

Kidd left Cities Service Oil Co. in 1953 to take over the president's post at Arkansas Fuel Oil Corp., a Cities Service subsidiary.

During his 3-year stay there, he is credited with a vigorous program which resulted in an all-time high for avgas supply contracts, a vastly expanded exploration program, and the completion of the $1 million Port Everglades terminal.

In his last year alone, he pushed construction of more than 100 super-service stations.

When the popular Kidd returned to Bartlesville as president of Cities Service Oil Co., personnel reacted almost as if the event were a coronation. There's no doubt that he's a real "prince" in the minds of his associates.

And it takes only a short visit with him to realize why.

Clarence E. Means, superintendent of Cities Service Oil Co.'s gasoline plant at Burrton, Kans., has been named operations superintendent for the company's new Roberts Ranch gasoline plant in Midland County, Texas. **Frank Snyder** will succeed Means at Burrton.

William H. Bruyere has joined Houston Contracting Co. as assistant to management. A graduate of the University of Texas, Bruyere has been with American Oil Pipeline Co. of Houston (formerly Pan American Pipeline Co.) for the past 9 years, serving as chief engineer for the past 6.

O. D. Thomas has been appointed Southwest regional geologist for Phillips Petroleum Co. in Bartlesville. He succeeds **R. J. Adams,** who has become division manager at Corpus Christi, Tex. **J. J. Tanner** replaces Thomas as geological assistant to the northern regional manager.

Personals

Joel C. Watts, district engineer with Skelly Oil Co. in Sterling, Colo., has joined Bethlehem Supply Co. in Tulsa.

John Herron, tool pusher for John Fox, DuBois, Pa., has joined S. W. Jack Drilling Co. of DuBois as a tool pusher.

C. W. Williams, senior petroleum engineer for Gulf Oil Corp. in Kermit, Tex., has been promoted to area engineer and transferred to Crane, Tex.

M. J. Melnyk has been appointed zone reservoir engineer, Regina, for British American Oil Co., Ltd. **N. Ludwick** has been named zone mechanical engineer.

D. J. Sullivan has been appointed assistant general manager of operations for Arabian American Oil Co. Sullivan has been acting in this capacity since June 1955. In other Aramco appointments **D. N. Ezzell** was named district manager and **F. E. Abbott** assistant district manager at Abqaiq.

Herbert J. Weeks, formerly head of the geological staff, Sun Oil Co., Philadelphia, has been appointed geological

S. M. VAUCLAIN

H. J. WEEKS

counselor for foreign operations. He has been with the company since 1930. **Samuel M. Vauclain, III,** staff geologist, has been named head of Sun's Philadelphia geological staff for United States and Canadian activities.

W. G. Moriarity, formerly superintendent of Magnolia Petroleum Co.'s Oklahoma production division, has been promoted and transferred to Dallas as assistant general superintendent of production. **H. K. Holland** has been promoted by the company from division petroleum engineer at Midland, Tex., to superintendent of the Oklahoma production division replacing Moriarity. **I. B. Stitt, Jr.,** has been promoted from assistant division petroleum engineer to division petroleum engineer at Midland replacing Holland. **E. G. Thurman, Jr.,** petroleum engineer at Houston, replaces Stitt as assistant division petroleum engineer at Midland.

Engineers, Geologists Attend Well-Log School

Nineteen petroleum engineers and geologists representing 12 oil and gas companies attended a Well Log Interpretation school July 23-August 3 in the Commodore Perry Hotel, Austin. The school was conducted by Jack Grynberg and Dr. Sylvain J. Pirson. Pictured are front row, left to right: Harold Sikes, United Carbon Co.; Holland Hunter, Tennessee Gas Transmission Co.; Vance Hester, Argo Oil Corp.; Pirson, University of Texas; and D. D. Lybarger, Sohio Petroleum Co. Second row, left to right: R. E. Hartline, Well Surveys, Inc.; Hoke Smith, Oklahoma Natural Gas Co.; and Tom McBrayer, Western Natural Gas Co. Third row, left to right: Leonard Simmering, Eason Oil Co.; Fay Coil, Superior Oil Co.; Bill Penn, General Crude Oil Co.; T. G. Roberts, British-American Oil Producing Co.; Bill Shaffer, Argo Oil Corp.; Gene Rice, Signal Oil & Gas Co.; and Jack Grynberg at the blackboard. Fourth row, left to right: Raymond Hillier, Superior Oil Co.; Jerry Sides, Superior Oil Co.; J. T. Skeith, Oklahoma Natural Gas Co.; L. B. Culwell and Don Herron, both of Argo Oil Corp. Not pictured is Burl Wingrove, Nash Oil Co.

R. S. Hunt, Cities Service district geologist in Rosewell, N. M., has been appointed division exploitation geologist at Midland, Tex. Hunt succeeds **L. E. Patterson** who has resigned. **M. F. Kennedy,** Midland, succeeds Hunt at Roswell.

Jerry Covington has resigned as general manager of Dela Oil Co. to open his own office as a consulting geologist in Midland, Tex. Covington has been with Dela since 1954 and was previously with Humble Oil & Refining Co.

J. Ed McHale has been named assistant manager of Magnolia Petroleum Co.'s crude-oil purchases and sales department at Dallas. **C. Fred Carl,** now area representative for the department at Wichita Falls, Tex., will be promoted to administrative assistant at Dallas September 1. **J. R. Lennon** of the Midland, Tex., district will succeed Carl as area representative at Wichita Falls.

W. J. Bowen has been elected president of Coastal Transmission Corp. Bowen joined Delhi-Taylor Oil Corp., Coastal's parent company, in 1949. He has been a vice president of Coastal for the past 2 years. **John O. Sue,** president of the company since its organization 2 years ago, has been elected chairman of the board. Sue was assistant production manager in charge of the gas department of Humble Oil & Refining Co. before his retirement in 1954.

William G. Cutler, district drilling manager with Pacific Northwest Pipeline Corp., has been appointed assistant manager of production operations and transferred from Farmington, N. M., to Salt Lake City.

M. D. (Dale) McBride has been appointed manager of Mesa Drilling Co., Denver, a division of Camay Drilling Co. McBride retired recently as executive vice president of Arrow Drilling Co.

Raymond M. Camp, formerly superintendent of alkylation and isomerization at Tidewater Oil Co.'s Flying A refinery, Avon, Calif., has been named a processing superintendent at Tidewater's Delaware Flying A refinery, under construction near Delaware City. Other processing superintendents named at Delaware City are **Lloyd E. Forbes,** foreman of catalytic cracking plant at Avon refinery; **M. David Hayes,** former chief process engineer, Bayonne, N. J. refinery; **Robert M. Hunt,** former supervisor of paraffin and lubricating department, Bayonne; and **E. L. Raun,** process superintendent at Bayonne. **Robert B. Beattie,** who was coordinator on the new refinery project, was named superintendent of engineering, maintenance, and construction. **R. S. Stanfield,** formerly chief engineer at Bayonne, was named refinery representative. **Dr. Arthur W. Lewis,** who headed the research laboratory at Bayonne, was named superintendent of technology.

Joe Alcott, district civil engineer for Magnolia Petroleum Co. in Duncan, Okla., has been appointed assistant production foreman at Lindsay, Okla.

Harry A. Jackson, former vice president and general manager of eastern operations for Tidewater Oil Co., has been elected president of American Petrofina, Inc. Jackson has been in the oil business over 35 years and has been with Tidewater most of that time. American Petrofina is an affiliate of Cie. Financiere Belge des Petroles, an international integrated company.

L. F. Lockard has been transferred from division geophysicist in Sinclair Oil & Gas Co.'s Denver office to staff geophysicist in Tulsa.

Dwight Dodson, plant superintendent of Garber, Inc.'s, Garber, Okla., gas plant, has been promoted to construction superintendent with Houston Hydro-Carbon Corp., Crane, Tex.

Cecil C. Squire, formerly refinery superintendent, has been promoted to manager of field operations for Sunset Oil Co. **A. R. Jones** succeeds Squire as refinery superintendent, and **Tom Shields** has been promoted to pipeline superintendent.

Roderick J. Forsyth, Evansville, Ind., independent geologist, has been elected president of the Indiana and Kentucky Geological Society. **W. W. Hagan,** Owensboro, Ky., independent, was named vice president, and **Ed Wilson,** of Great Lakes Carbon Corp., Evansville, was elected secretary-treasurer. **James Kendall,** independent; **G. E. Ebmeyer,** of Jarvis Brothers; and **Roscoe E. Wise,** Sun Oil Co., all of Evansville, were named to the executive committee.

Damon Holditch, formerly manager of Lone Star Producing Co.'s South Texas exploration district at San Antonio, has been named manager of the company's newly opened South Louisiana exploration district at Lafayette, La. **John Cochran** replaces Holditch as exploration manager at San Antonio. The staff at the new Lafayette office also will include: **Kenneth Liles,** district geologist; **Tom Carlson,** district engineer, and **Marvin Munchrath,** staff geologist. **S. D. Farrar,** engineer in the company's district office in Midland, Tex., has been transferred to Oklahoma City in the same capacity.

John Loftis has been transferred from Corpus Christi to Midland, Tex., by Humble Oil & Refining Co. as division geologist of the West Texas division. He replaces **Bill Dougherty,** recently transferred to Houston.

D. E. Smith has been named district geophysicist at Stanolind Oil & Gas Co.'s Billings, Mont., exploration district office. He was formerly staff geophysicist for Stanolind in New Orleans.

W. Bernard Robinson has been appointed division chief geophysicist of the Tulsa production division of Gulf Oil Corp., effective September 1.

George H. Freyermuth, executive vice president of Esso Export Corp., an affiliate of Standard Oil Co. (N. J.), has been elected chairman of the board of Esso Export, Ltd., and Standard Oil International, Ltd.

Dr. Warren L. Jensen, former director of Continental Oil Co.'s central research division, Ponca City, has been appointed director of the development and research department's new petroleum-products division. **David B. Burrows** will head the department's technical services division. **Horace E. Luntz** has been named assistant to the manager of development and research. **D'Arcy A. Shock** succeeds Jensen as director of the central research division.

M. T. Stevens has been named manager of Calgary refinery for British American Oil Co., Ltd. Other managers named are **W. E. Lundie,** Clarkson, Ont.; **B. A. Barnhill,** Moose Jaw; and **C. W. Coote,** Edmonton. Coote succeeds **R. T. Watson,** who is retiring after serving 36 years in the company's manufacturing department. Appointed as assistant managers are **D. G. Berry,** Clarkson; **R. C. Beal,** Montreal East; **R. M. Donald,** Edmonton, and **H. A. Hornfelt,** Calgary.

Personals

T. C. Danie, Jr., has been named staff assistant to Sohio Petroleum Co.'s Gulf Coast division manager. Danie was formerly senior geologist in the company's Houston district.

William J. Hunter, Gulf Coast division petroleum engineer for The California Co., has been promoted to assistant chief petroleum engineer and transferred from Harvey, La., to New Orleans.

Reorganization of Sinclair Refining Co.'s manufacturing department has led to appointment of managers for five new operating divisions. The division managers are: **R. E. Howe,** processing division; **J. E. Bell,** engineering and

HOWE

BELL

KUHN

HILL

maintenance division; **G. F. Kuhn,** refinery production division; **K. A. Beach,** asphalt and chemicals division; and **A. D. Hill,** lube oil production division. Kuhn will also serve as interim manager of the light oil production division.

DEATHS

Chester Robert Upham, 62, widely known natural-gas producer and distributor in Texas, died after a lengthy illness in Los Angeles. Upham and his father, the late David A. Upham, pioneered the development of natural gas in the Texas Panhandle and built the first large-diameter gas line in the Panhandle in 1926.

John Paul Dobbins, 66, engineer with the old Cosden Oil Co. and later with Mid-Continent Petroleum Corp., died August 2 in Tulsa.

Col. John Henry (Jack) Lapham, 71, a director of The Texas Co., was killed August 2 in a plane crash near Bander, Tex.

Evans Monroe Hunsberger, 54, died August 1 in Oil City, Pa. Hunsberger had been with the Quaker State Refining Co. since 1924.

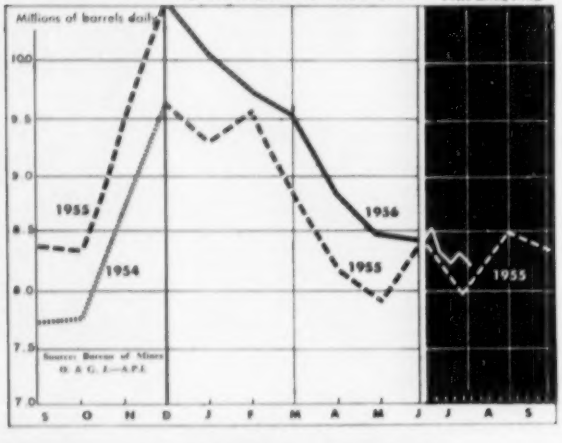
Charles Milo Abercrombie, 58, independent oil operator, died August 5 in Houston. He was a graduate of Texas A. & M. College.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,091,150	DOWN	10,800	UP	455,050
Crude stocks	277,040,000	UP	2,113,000	UP	7,900,000
Completions	1,234	UP	72	DOWN	87
Refinery runs	7,964,000	DOWN	26,000	UP	477,000
Gasoline stocks	177,561,000	UP	509,000	UP	21,085,000
Kerosine stocks	29,607,000	UP	724,000	DOWN	2,868,000
Distillate stocks	119,289,000	UP	5,689,000	DOWN	190,000
Residual stocks	44,598,000	UP	1,430,000	DOWN	675,000
Four-product stocks	371,055,000	UP	8,352,000	UP	17,352,000
Total imports	1,425,600	DOWN	19,300	UP	412,500

TOTAL DEMAND—ALL OILS



Weakness in Markets Continues; Suez Crisis Could Reverse Trend.

WITH occasional sales at scattered points reflecting excess product supplies at several refining centers, market observers over the past week looked to the Suez Canal and Middle East for possible developments which might quickly reverse trends in world markets.

While refinery prices in key markets were generally unchanged over the past week, there was more evidence of weakness than strength in new transactions. This applied not only to gasoline burdened with excess inventories at several points, but also to distillates.

Relative to the Suez Canal and Middle East, probably a majority of those in close touch with refinery markets feel that the current political crisis will be solved without a disruption in petroleum movements sufficient to be reflected in refinery markets. But others are not so sanguine.

They point out that the Middle East accounts for 23 per cent of the free world's petroleum supply and averaged 3,393,000 bbl. daily in May. It is estimated that about 1,400,000 bbl. daily of this output in the form of crude oil or products passes through the Suez. Western Europe and the Western Hemisphere would lose this supply immediately should the canal operations be shut down for a time. Syria, which is supporting the Egyptian position in regard to the canal, has threatened to shut down the pipelines from northern Iraq and the Persian Gulf, within its boundaries. If this were done an additional supply in excess of 800,000 bbl. daily would be shut off.

As to what this possible development would mean market students point to what happened in 1951 when Iran canceled a 650,000-bbl. daily supply in nationalizing its oil industry. It required emergency operations by the world-wide oil industry to breach this gap and markets stiffened practically everywhere. A shutdown of the Suez Canal and the eastern pipelines would further advance an already-tight world tanker market.

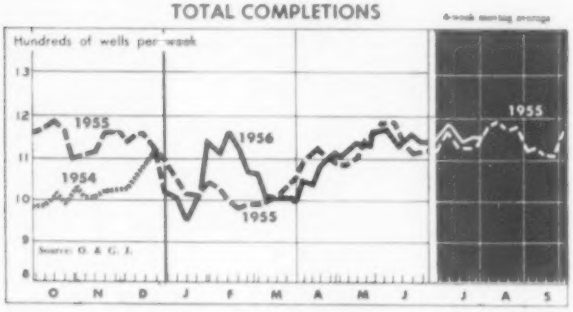
In the meanwhile the domestic refinery market continues to be plagued with oversupply. While general quotations are unchanged gasoline sales under the published prices in spot tanker, tank-car, and pipeline deliveries are reported reflecting a basic weakness.

Distillate stocks are still under a year ago but the recent rate of seasonal increase, if not stopped, will result in excess stocks before the maximum season of consumption gets under way.

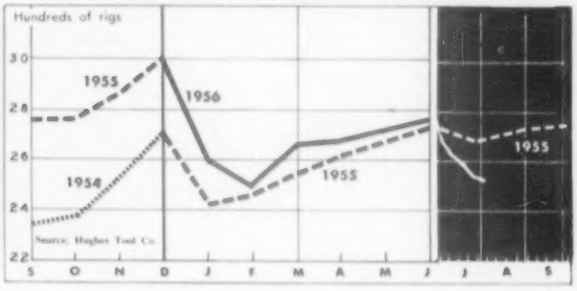
Analysts are in agreement that these and other phases of the refinery statistical situation in domestic operations, have passed the point where shifts in yields of products can correct the lack of balance in product-inventory positions. They agree that a reduction in crude runs to stills is desirable at this time with the largest reductions needed in the areas where the greatest unbalance exists.

In regard to the required reductions it is pointed out that the latest A.P.I. report and that of the Bureau of Mines for July 1955 show that East Coast refiners account for 24 per cent of the gain over a year ago in gasoline stocks. Middle West refiners are responsible for 26 per cent and Texas Gulf Coast refiners, 19.4 per cent. The stock gains over a year ago in all these areas are greater than the national average.

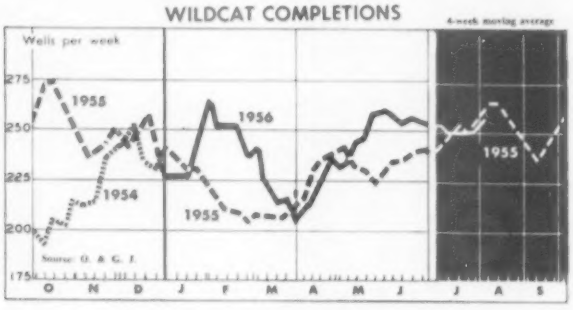
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	8-6-56	7-30-56	8-8-55
North Central and East	133	127	160
Southeast	39	35	32
Okla., Kans., Ark., Mo.	420	431	530
Louisiana	450	456	407
North and East Texas—Panhandle	371	357	384
Gulf and South Texas	252	258	247
West Texas-New Mexico	487	489	515
Rocky Mountain	259	279	321
Pacific Coast	109	104	143
Total United States	2,520	2,536	2,739
Western Canada	238	247	212

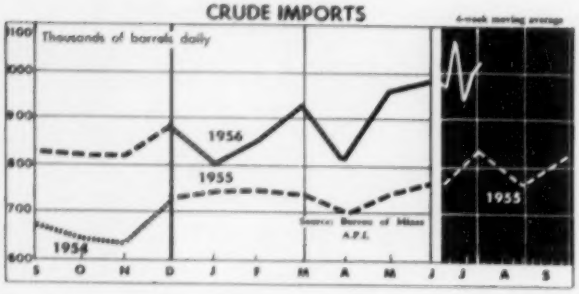
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 4, 1956

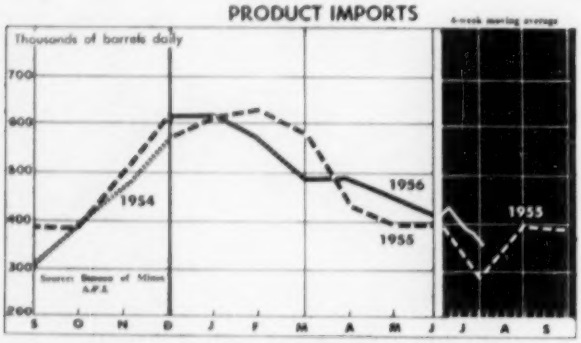
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	1	0	0	11,037	64	48	0	0	0	0	0	0	0	1	29	30
Arkansas	40	31	0	9	111,083	489	447	0	0	0	4	4	24	0	3	82	109
California	40	28	2	10	215,705	1,301	1,506	0	0	1	10	11	31	0	5	253	289
Colorado	31	4	2	25	163,879	706	849	0	0	1	20	21	18	0	10	323	351
Illinois	98	56	1	41	250,186	2,265	2,252	1	0	0	15	16	32	0	1	405	438
Indiana	15	8	0	7	25,742	378	441	0	0	0	4	4	13	0	1	68	82
Kansas	111	51	6	54	379,350	3,063	3,016	1	0	0	18	19	76	2	19	542	639
Kentucky	43	16	7	20	72,119	1,045	787	0	0	0	12	12	26	0	1	216	243
Louisiana	62	31	6	25	407,051	2,292	2,364	2	0	1	11	14	72	32	41	304	449
North	33	18	5	10	127,801	954	1,245	2	0	1	5	8	20	1	3	121	145
South	21	8	1	12	212,268	1,071	1,119	0	0	0	6	6	41	28	26	163	258
Offshore	8	5	0	3	66,982	267	(1)	0	0	0	0	0	11	3	12	20	46
Michigan	10	3	0	7	33,384	270	308	0	0	0	6	6	5	0	0	93	98
Mississippi	10	3	0	7	72,277	264	287	2	0	0	5	7	12	1	1	111	125
Montana	20	6	0	14	85,468	234	187	0	0	0	10	10	10	0	0	70	80
Nebraska	25	8	0	17	156,208	611	461	1	0	0	14	15	26	0	0	274	300
New Mexico	46	25	12	9	172,256	1,131	984	1	0	0	7	8	32	0	6	104	142
Northwest	18	3	11	4	63,805	445	316	1	0	0	3	4	4	0	5	33	42
Southeast	28	22	1	5	108,451	686	668	0	0	0	4	4	28	0	1	71	100
North Dakota	5	2	0	3	28,759	145	136	0	0	0	3	3	7	0	0	36	43
Ohio	20	15	3	2	38,230	589	673	0	0	0	0	0	0	0	1	5	6
Oklahoma	194	107	9	*78	628,788	5,145	5,236	2	0	0	14	16	77	16	26	422	541
Pennsylvania-New York	4	0	4	0	17,589	631	949	0	0	1	0	1	0	0	6	10	16
Texas	426	270	10	146	1,707,405	13,096	12,135	15	0	0	93	108	451	22	112	2,777	3,362
Southwest (1 & 4)	78	48	1	29	228,564	1,944	1,844	3	0	0	20	23	86	5	41	520	652
Gulf Coast (2 & 3)	43	23	2	18	299,636	1,570	1,530	2	0	0	14	16	44	11	39	418	512
East (5 & 6)	19	12	1	6	98,571	652	588	1	0	0	6	7	10	1	5	233	249
N. Central (7-B & 9)	156	81	0	†75	448,181	4,723	4,540	6	0	0	38	44	196	0	4	1,119	1,319
West (7-C & 8)	91	77	0	14	504,296	3,416	3,034	3	0	0	13	16	106	0	9	445	560
Panhandle (10)	39	29	6	4	128,157	791	599	0	0	0	2	2	9	5	14	42	70
Utah	3	0	1	2	16,738	75	48	0	0	1	2	3	2	0	3	40	45
West Virginia	12	1	7	4	34,333	378	357	0	0	0	0	0	0	0	6	7	13
Wyoming	18	7	0	11	71,183	477	476	0	0	0	7	7	9	0	7	119	135
Miscellaneous	0	0	0	0	0	64	20	0	0	0	0	0	4	0	0	52	56
Total United States	**1,234**	673	70	491	4,698,770	34,713	33,967	25	0	5	255	**285**	927	73	250	6,342	7,592
Total previous week	1,162	632	83	447	4,581,511			34	0	12	220	266	902	73	245	6,087	7,307
Total Aug. 6, 1955	1,321	755	78	488	5,293,025			45	3	8	222	278	982	124	221	5,849	7,176
Cumulative 1956	34,713	19,033	2,309	13,371	140,498,561												
Western Canada	87	70	5	12	448,553												

Service wells included: *9, †3. ‡Included in South Louisiana.

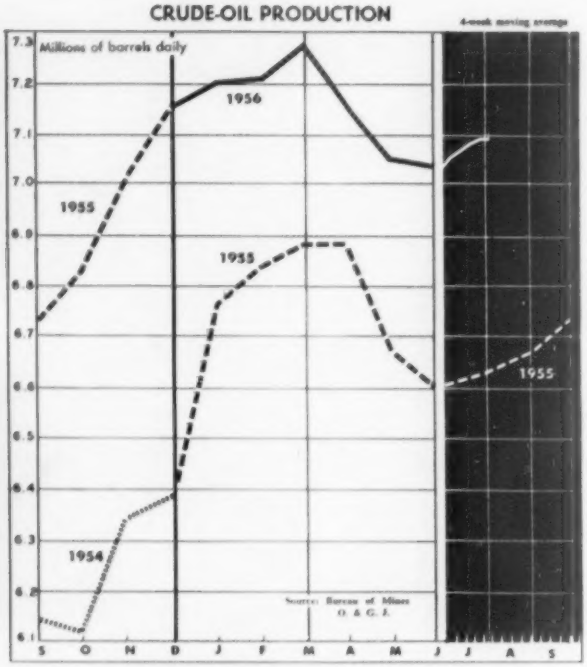
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

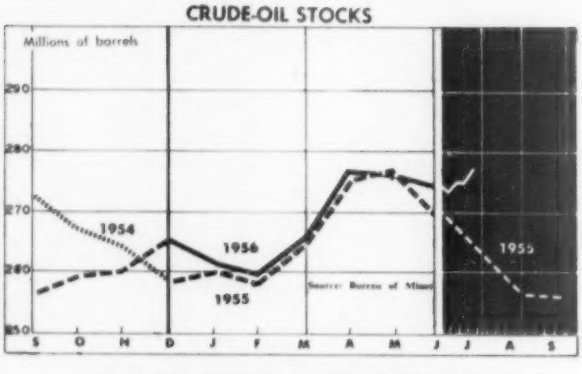


DAILY AVERAGE PRODUCTION FOR WEEK

	August 4, 1956 Crude oil	Lease condensate	Total	July 28 total
Alabama	7,400	....	7,400	7,500
Arkansas	75,300	400	75,700	76,200
California	959,600	....	959,600	960,400
Colorado	166,500	....	166,500	167,100
Eastern	50,200	....	50,200	50,600
Florida	1,275	....	1,275	1,325
Illinois	227,600	....	227,600	230,300
Indiana	30,700	....	30,700	31,500
Kansas	346,600	....	346,600	345,200
Kentucky	48,300	....	48,300	48,500
Louisiana	731,625	55,550	787,175	785,950
North	121,050	2,050	123,100	122,950
South	610,575	53,500	664,075	663,000
Michigan	27,800	....	27,800	27,800
Mississippi	107,550	4,650	112,200	111,650
Montana	63,100	....	63,100	63,300
Nebraska	39,400	....	39,400	38,600
New Mexico	235,225	3,800	239,025	237,425
North Dakota	36,800	....	36,800	37,200
Oklahoma	567,100	....	567,100	585,500
Texas	2,965,075	47,800	3,012,875	3,001,800
Dist. 1	56,000	425	56,425	56,425
Dist. 2	146,575	7,925	154,500	155,000
Dist. 3	434,850	22,400	457,250	456,500
Dist. 4	236,150	5,700	241,850	239,500
Dist. 5	43,575	350	43,925	44,375
Dist. 6	123,850	5,300	129,150	128,500
East Texas Field	210,500	....	210,500	210,500
Dist. 7-B	156,850	50	156,900	156,050
Dist. 7-C	185,425	3,700	189,125	185,800
Dist. 8	1,057,150	1,500	1,058,650	1,056,600
Dist. 9	215,850	300	216,150	215,400
Dist. 10	98,300	150	98,450	97,150
Utah	5,100	....	5,100	5,000
Wyoming	286,400	....	286,400	288,800
Others	‡300	....	‡300	300
Total U. S.	6,978,950	112,200	7,091,150	7,101,950
Change from previous week, down			10,800	
Canada	†368,978	....	†368,978	†441,000
Total U. S. production January 1-August 4			1,552,201,420 bbl.	
Same period last year (crude plus cond.)			*1,458,467,466 bbl.	

*Includes 24,290,550 bbl. condensate. †Week ended previous Monday. ‡Nev. 200, S. D. 100.

CRUDE-OIL STOCKS



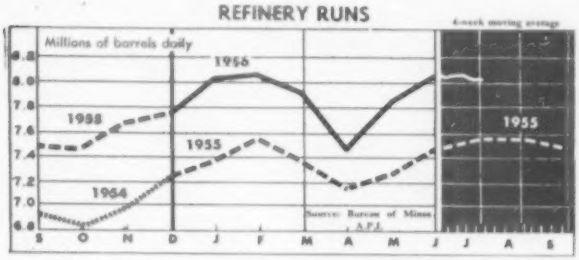
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

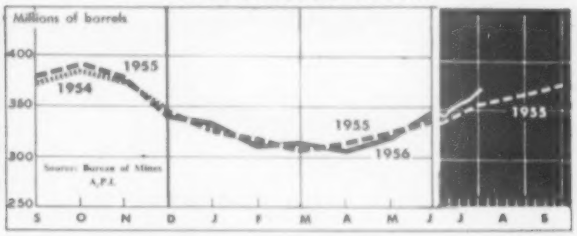
	7-28-56	7-21-56	7-30-55
Pennsylvania Grade	2,529	2,545	2,813
Other Appalachian	2,336	2,264	1,943
Illinois, Indiana, Michigan	10,521	10,491	10,896
Nebraska, North Dakota	2,403	2,572	2,136
Kansas	9,712	9,770	8,117
Oklahoma	27,197	27,248	22,457
Arkansas	2,809	2,900	2,604
Louisiana	16,253	15,289	17,397
North	2,601	2,618	2,685
South	13,652	12,671	14,712
Mississippi	2,976	2,897	3,106
New Mexico	8,162	8,087	8,312
Texas	122,133	121,960	126,285
East Texas proper	8,986	9,454	9,862
West Texas	60,135	59,414	57,886
Texas Gulf	22,275	22,047	25,368
Other Texas	30,737	31,045	33,169
Wyoming	20,137	19,592	14,772
Other Rocky Mountain	7,157	7,034	5,107
California	28,006	27,703	30,927
Foreign	14,709	14,575	12,268
Total	277,040	274,927	269,140

*Bureau of Mines. †Includes 4,619,000 bbl. in California.

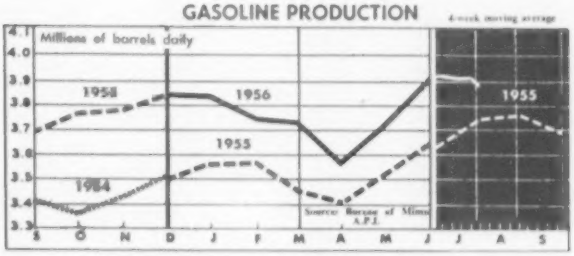
REFINERY RUNS



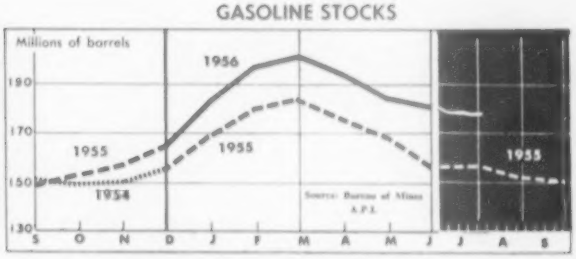
FOUR-PRODUCT STOCKS



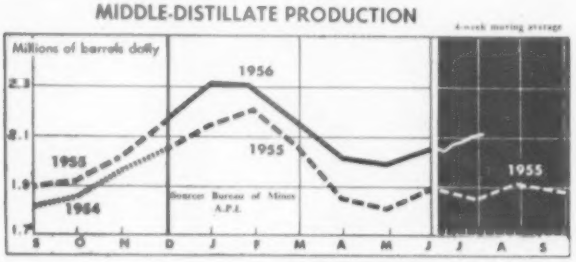
GASOLINE PRODUCTION



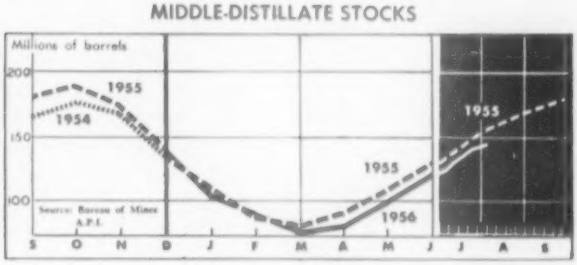
GASOLINE STOCKS



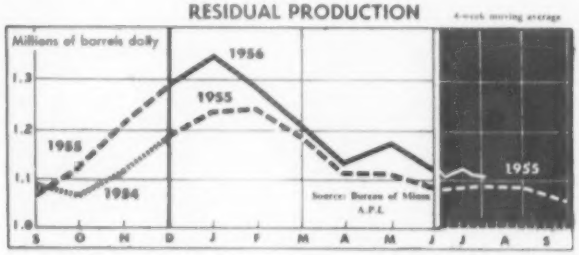
MIDDLE-DISTILLATE PRODUCTION



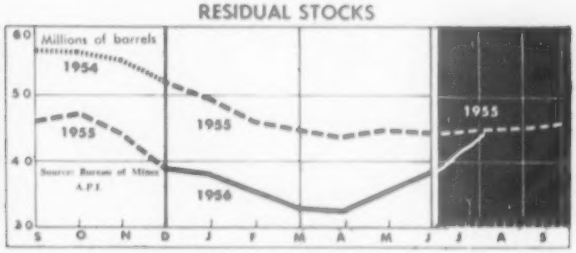
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, AUGUST 3

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1955—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,176	505.4	31.1	323.3	201.0	41,302	11,386	40,226	11,521	1,056	454.6	23.4	268.0	193.0
Apalachian:														
District 1	102	43.4	2.6	26.9	4.3	4,679	786	2,561	561	92	38.1	3.8	21.7	5.0
District 2	91	53.6	2.6	17.0	8.7	2,881	749	850	500	100	56.4	2.6	11.5	13.2
Ind., Ill., Ky.	1,402	741.6	76.1	267.4	156.1	31,567	6,063	16,842	5,281	1,372	735.2	65.8	263.1	146.6
Minn., Wis., Dak.	93	44.9	9.6	21.7	6.3	6,880	1,195	6,533	258	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	728	387.2	16.0	180.0	35.4	15,556	1,720	11,855	1,398	686	389.6	15.3	157.8	20.7
Inland Texas	256	185.0	9.6	55.1	23.7	6,838	554	1,798	1,541	257	181.3	8.4	51.3	20.8
Texas Gulf Coast	1,917	932.4	75.7	495.9	240.6	24,302	3,612	15,537	6,827	1,864	887.8	102.0	436.7	256.3
La. Gulf Coast	664	317.6	29.3	170.9	36.9	10,006	2,296	6,455	1,669	676	341.2	51.7	173.3	48.7
N. La. and Ark.	97	39.4	6.3	24.4	6.9	4,752	516	1,650	160	94	35.9	7.3	22.6	5.8
Rocky Mountain:														
New Mexico	20	10.4	0.1	2.7	1.6	405	11	98	19	21	11.4	0.2	3.7	1.2
Other Rocky Mt.	285	131.3	3.0	67.3	34.1	6,126	374	2,986	908	278	130.0	3.7	58.0	37.3
West Coast	1,133	471.4	2.9	181.8	323.1	22,267	345	11,898	13,955	1,084	511.2	5.3	152.9	339.5
Aug. 3, 1956	7,964	3,863.6	264.9	1,834.4	1,078.7	177,561	29,607	119,289	44,598	7,580	3,772.7	289.5	1,620.6	1,090.1
July 27, 1956	7,990	3,924.9	314.3	1,804.6	1,089.9	177,052	28,883	113,600	43,168					
Aug. 5, 1955	7,487	3,707.6	299.1	1,580.4	1,020.9	156,476	32,475	119,479	45,273					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Included in Ind., Ill., Ky.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.375-12.00
Premium (96 octane)	13.125-13.75
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.25-11.50
Regular (92 octane)	11.50-12.00
Premium (97 octane)	13.00-13.25
Premium (98 octane)	13.25-13.75
California—Los Angeles (rack):	
Regular (84 octane)	12.9-13.3
Premium (93 octane)	14.9-15.3
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grades 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.00
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	8.75-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	9.125
Distillate No. 2	8.50
New York Harbor (barges):	
Kerosine 41-43	10.85
Distillate No. 2	10.35
Diesel fuel, 48-52 d.i.	10.65
Caribbean area (cargoes):	
Distillate No. 2	8.50

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.00-2.10
Gulf Coast (cargoes):	
Bulker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.80
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15-2.25

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	26
200 vis. neutral (180 at 100°), 25 p.t.	23

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.02				
15-15.9	2.08				
16-16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$3.01	2.45	
25-25.9	2.64	2.60	3.03	2.47	$2.13
26-26.9	2.69	2.62	3.05	2.49	2.19
27-27.9	2.76	2.64	3.07	2.51	2.24
28-28.9	2.83	2.66	3.09	2.53	2.29
29-29.9	2.91	2.68	3.11	2.55	2.34
30-30.9	2.97	2.70	3.13	2.57	2.39
31-31.9	3.04	2.72		2.59	2.44
32-32.9	3.12	2.74		2.61	2.48
33-33.9	3.20	2.76		2.63	2.52
34-34.9	3.27	2.78		2.65	2.56
35-35.9	3.34	2.80		2.67	2.60
36-36.9	3.39	2.82		2.69	2.64
37-37.9		2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, July 16, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.57
Middle District	4.44
Southwest Pennsylvania	4.15
West Virginia	4.03
Buckeye Grade	3.97
Zanesville Grade	3.15
Illinois Basin	**2.90**
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.8°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	‡2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

Gulf-U.S.N.H., dirty (USMC+42.5%)	$4.06
N.W.I.-U.S.N.H., dirty (USMC+32.5%)	3.58
★ N.W.I.-U.K., dirty (Scale+45%) (47s. 2d.)	6.57
★ Lebanon-U.K., dirty (Scale+97.5%) (56s. 0d.)	7.80
★ P.G.-France, dirty (USMC+30%)	14.17

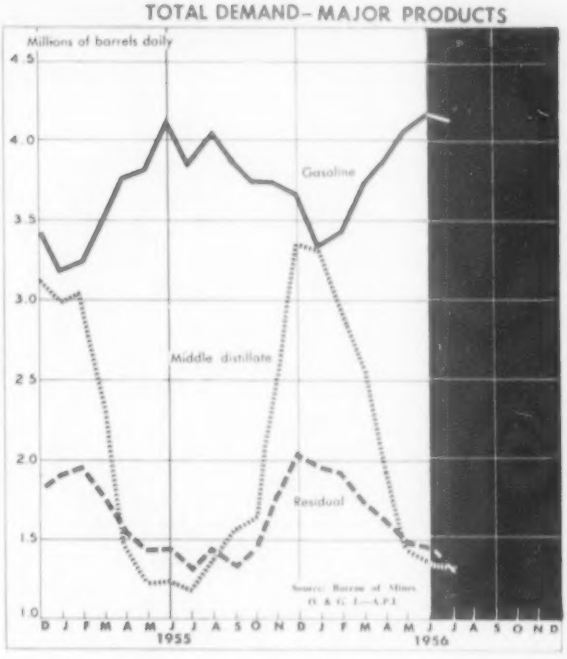
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

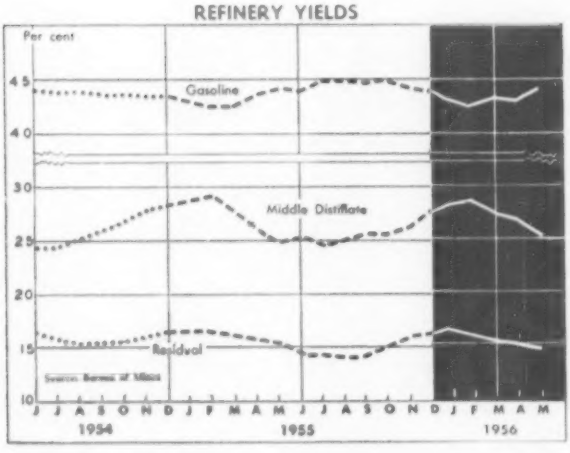
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
July 1956*	4,122	3,899	177,350
June 1956*	4,136	3,902	181,500
May 1956	4,093	3,756	186,673
August 1955	4,033	3,773	151,912
July 1955	3,847	3,744	157,079
KEROSINE			
July 1956*	192	301	29,300
June 1956*	153	295	25,800
May 1956	179	292	21,883
August 1955	207	290	35,292
July 1955	192	286	32,749
DISTILLATE			
July 1956*	1,099	1,806	116,850
June 1956*	1,173	1,751	93,700
May 1956	1,286	1,667	75,928
August 1955	1,170	1,621	133,675
July 1955	993	1,575	119,169
RESIDUAL			
July 1956*	1,283	1,106	43,980
June 1956*	1,436	1,119	38,400
May 1956	1,478	1,149	36,607
August 1955	1,439	1,090	45,480
July 1955	1,328	1,091	44,894

*Preliminary. †Thousands of barrels.

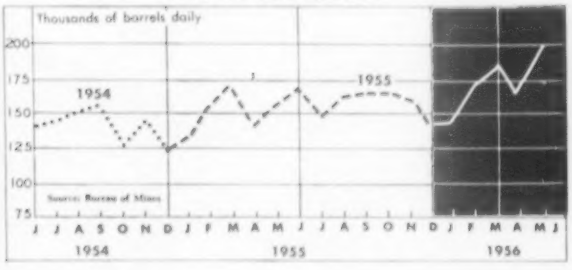
TOTAL DEMAND—MAJOR PRODUCTS



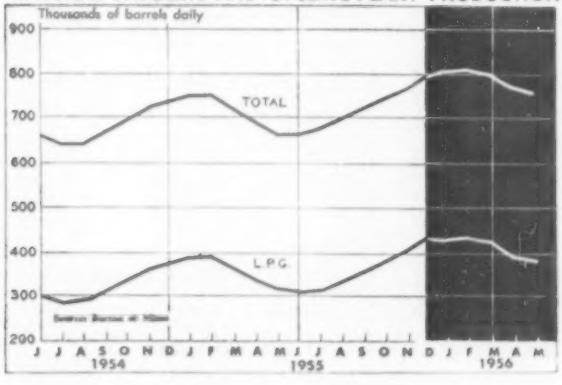
REFINERY YIELDS



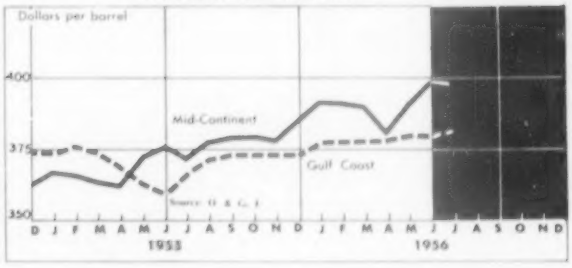
JET-FUEL PRODUCTION



NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



REFINERY REALIZATION



REFINERY REALIZATION

	July* 1956	June* 1956	May 1956	July 1955
Mid-Continent	$3.91	$3.98	$3.91	$3.73
Gulf Coast	3.82	3.78	3.80	3.66

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel oil, and residual as published in The Oil and Gas Journal.

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1 BUCYRUS 22 mounted on 6x6 truck. 1 6x6 GMC truck water tank. Rig has been used for setting surface pipe. Fully equipped and ready to go to work. Gaines Drilling Company, P. O. Box 547, El Dorado, Kansas, Telephone 2317.

UPSET TUBING (23,000') 2⅛" O.D. new electric weld Range 2, External Upset tubing, 8 Rd. thd. Immediate delivery. Write Box J-663, The Oil and Gas Journal, Tulsa, Oklahoma.

GENERATOR—A. C. Century 1200 R.P.M. 3 phase 60 cycle 480 volt 60 K.W. Type A.G.C. Rebuilt by Century since used—located at St. Elmo, Illinois—$1250.00—Lawrence Masters, Crossville, Illinois.

CARDWELL MODEL "S", double drum with WAK Waukesha, 87 foot Moore mast, folding platform, substructure; Emsco 7⅛ x 14 pump with two WAK Waukesha; rotary, block, hook, kelly, swivel, BOP, light plants, tool house, bunk house, miscellaneous equipment. Box 3246, Corpus Christi, Texas.

PIPE FOR SALE

NEW — IMMEDIATE DELIVERY

1141 feet BLACK SEAMLESS STEEL CASING—5" OD x 18# T&C

38 Jts: This is new pipe purchased from Valley Steel Products in December at a cost of $2150. NO increase in price. Near Poplar Bluffs, Mo.

Call or write Glen C. Bull, 2800 Quebec St. N. W., Washington, DC. or Ph. Em 3-5758.

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All equipment and machinery for sale at fraction of original cost.

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Field Office: Cabin Creek (suburb of Charleston, W. Va.)

Phone East Bank 5611. Roy Crisp, Mgr. P. O. Box 2921, Charleston, W. Va.

FOR SALE EQUIPMENT

OIL WELL CASING, (26,000') 6⅝" O.D. 18# New electric weld Range 3, hydrostatically tested, 7¼" long API 8 Rd thd. collars excellent substitute for 5½" O.D. 17# or 7" O.D. 17-20# casing. Some new EUE tubing also available. Box J-664, The Oil and Gas Journal, Tulsa, Oklahoma.

1—34-L BUCYRUS-ERIE Spudder mounted on 6x6 GMC truck. Junk rack, light plant, good wire lines and tailing in tools for 5 inch and 7 inch hole. Casing tackle strut on mast. Machine in condition. Gaines Drilling Company, P. O. Box 547, El Dorado, Kansas, Telephone 2317.

FOR SALE

Aluminum Line Pipe, 26,600' of 6⅝" O.D. 2.80 Wall, 6.586#, 40' lengths, located Magnolia, Arkansas. Also have large stock New & Used Casing, Tubing, Surface Pipe & Line Pipe.

Sabine Pipe & Supply Co.
Phones 3094 - 3095
Kilgore, Texas

FOR SALE EQUIPMENT

CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

GASOLINE PLANT EQUIPMENT FOR SALE

1—800# 20 MMCF Absorber with Scrubber, etc.
1—6 Cyl. Buda Engine, 343 H.P. at 900 RPM with Starting Engine.
1—Fluor "Counterflo" Induced Draft Cooling Tower Complete.
2—30 MMCF LTX Units.
Vessels, Generators, Pumps, Instruments, Pipe, Valves, and Fittings and Other Equipment necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

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COMPLETE POLY UNIT, BUILT 1956 UOP RATED 144 BBL./DAY

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
20—Brown fintube exchangers, 600# 140 sq. ft. 4-6 chrome.
20—Brown fintube exchangers. 600# 11, 21, 77, 101, 140 sq. ft.
8—Adm. Heat Exchangers, 644, 434, 346, 176 sq. ft.
1—6' x 96' tower, 40 tray, 135# WP.
1—6' x 34' Vacuum tower, 150#.
1—3' x 80' tower, 34 trays.
5—Welded tanks, 10' x 40', 10' x 30' 5' x 20'.
7—Oilfield boilers, 100 hp., 275#
1—Ethyl lead plant.
2—Convection furnaces, 20 MIL BTU/hr
1—Vapor phase cracking furnace.
13—Welded storage tanks, 5000, 2000, 1,800, bbl.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.
30—Duplex piston pumps, all sizes.
1—10' x 30' asphalt still.
6—Steel Bldgs., 20 x 150, 20 x 20, 20 x 40,
1—BS&B Oil and gas separator, 10.7 mcf, 3500 BBl./day.
Large Selection of Series 15, 30 Steel Valves, 1" to 8".
Approximately 15,000 ft. Schedule 40, 80 pipe, 2" to 8".

TOWERS & VESSELS

8' x 75' 35 tray 40#
3' x 42' 30 tray 250#
12" x 35' 30 tray 500#
3—8½' x 25' hor tanks 50# WP.

COMPRESSORS

2 Worth LTC-6 800 hp.
1 Worth LTC-3 400 hp.
3 Penn Comps 100 CFM 500 lbs. 385 CFM 160 lbs.

MISCELLANEOUS

6—Adm. 785, 742, 425 sq. ft. ht. exch.
30—304 SS shell & tube condensers 100-1000 sq. ft.
Lab Petro-Chem furnace 50,000 BTU/hr. 800 ft. of 2" 4-6 ch pipe
Large quantity of 410 SS chrome strips and sheets.
Tremendous selection stainless steel and steel valves ⅛"-6".
BJ hot oil pump 3 x 9, 13 st, 225 gpm, 4500' hd.
Gould 16" pump 10,500 gpm, 135' hd

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BRILL EQUIPMENT COMPANY

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or
2401 Third Ave., New York 51, N. Y., CYpress 2-5763

FOR SALE EQUIPMENT

1 WILSON JUNIOR Drawworks. Good motor, new brake bands and drilling drum. Worth the money. G and K Drilling Company, Inc., P. O. Box 547, El Dorado, Kansas, Phone: 392.

FAILING 1500 H.D. drill with 4½ x 5 pump, automatic pulldown, mounted on 1951 Ford. Also Griffin water tank, mounted on 1951 Ford. Write P. O. Box 819, Longmont, Colo., Phone 1333.

FOR SALE—Core Analysis Laboratory. Complete with Electric Retorts. Contact Chapman Pipe & Supply, ME 7-2493, Oklahoma City.

FOR SALE: One double rack oil loading rack capable of handling 20 cars on each side or a total of 40 cars double railroad track, with 10" main line and 3" risers and spouts to cars. This is not a shop made rack but was made by Black, Sivall, and Bryson. If interested, advise and quotation will be given. Louisiana Iron & Supply Co., Shreveport, Louisiana.

LINER FOR 5½" casing. 2500' 4"OD. 9.20 lbs., 11½" thread. Good body price 85c. M. J. Regan Pipe Co., Coffeyville, Kansas.

FOR SALE: National 50 Drilling Rig Complete, for details, call or write Ralph W. Shebester, Box 337, Pauls Valley, Oklahoma. Telephone 570.

Gaso Duplex 4¼" x 6" Power Pumps with Chrysler C-56 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
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LINE PIPE

32,000 ft., 6⅝ in.	18.97
70,000 ft., 4½ in.	10.97

No. 1, used, machine cleaned and straightened.

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LINE PIPE FOR SALE

8" O.D. 17 lb.	$1.00
7" O.D. 17 lb.	1.00
8⅝" 10 lb.	.50

All above sizes 40' random lengths. Clean, straight, beveled ready to lay. Ideal for any purpose.

M. J. REGAN PIPE CO.
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STEEL PIPE & TUBING

• CHROME MOLY • CARBON MOLY
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Widest Range of Sizes & Specs in the U. S.
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We have the following material available for immediate shipment out of our Dallas Stock:

40,000'—2-7/8" O. D. Used Seamless Upset Tubing
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Call George Barber at HAmilton 8-1301 in Dallas, Texas.

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FOR SALE EQUIPMENT

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

ENGINE BARGAINS—NXB Hercules Butane equipped $600.00; D-140 Le Roi, $475.00; CWR-Novo, $200.00; D-201 Le Roi, $553.00; H540 Le Roi Surge Tank and Cooling Coils, $1,548.00. All rebuilt and guaranteed. Carson Machine & Supply Co., P. O. Box 4547, Phone: ME 8-1511, Oklahoma City, Okla.

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A-128 EMSCO MAST, 340,000 lb. Capacity, 136 ft. high, 8 ft. high x 43 ft. long substructure, complete stairs and flooring. $12,500. Stored at Lafayette, Louisiana. Norvell-Wilder Supply Company, Box 2178, Houston, Texas. Phone CA 8-3471.

FOR SALE at our Tallant Chemical Plant —One steel smoke stack 3'6" x 100' high with rectangular base ¾" steel. Lowered ready for truck movement. $500.00. Cities Service Oil Company, Bartlesville, Oklahoma. H. D. Patridge.

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PHILLIPS OIL REFINERY, POCATELLO, IDAHO*

All equipment must be removed in 90 days

TOWERS

3'x32' 18 trays, 250 PSI.
3'x48' 20 trays, 200 PSI.
3'6"x34' Scrubber.
3'0" x 27' SS lined, 450 PSI.
4'x50' 23 trays, 160 PSI.
4'6"x40' 13 trays, 150 PSI.
8'x36' Scrubber, 240 PSI.
7'6"x41' Insulated, 160 PSI.

FURNACES

10 MILLION BTU/HR.—NEW 1936-40
18'x20'x13' Oil/Gas Burners chrome tubes.
7'x13'x12' Oil/Gas Burners chrome tubes.

HEAT EXCHANGERS—STEEL SHELL

6—Adm. Tube Multi-Pass 141-440 sq. ft.
3—Steel Tube Multi-Pass 117-252 sq. ft.

ETHYL BLENDING PLANT

4250 gal. Tank with pumps, scale, dye pot, all valves, fittings, pipe.

BOILERS

1—250 HP B. & W. Stirling W.T. 150 PSI
3—153 HP ASME Union W.T. 160 PSI
2—Steel Sectional Stacks 4'x135'.

PUMPS

SIMPLEX	DUPLEX
12x5½x12	10x7x12
6x6x12	7½x6x10
6x5x13 (2)	7½x5¾x6
6x3x8	6x3¾x6 (4)
4½x3x6	6x4x8 (4)
	4½x3x4 (7)

CENTRIFUGAL M.D.

8" Worth. (3) 2" Worth. (4)
3" Gould (2) 1¼ Amer. Marsh

FURNACE TUBING—NEW

1035' 4-6⅝ chrome 3" OD x ¼" wall

TANKS—WELDED

15,000 gal. 10'8"x23' vert. & hor. (4).
9,000 gal. 7'x30' hor. (2)
5,000 gal. 5'x35' hor. & vert. (3).
16 Tanks from 200 to 1500 gal.

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75,000 lb./hr. 400 PSI Combustion Engr
304 HP 125 PSI firetube
100 HP 300 PSI oil fired.
80 HP 150 PSI oil fired.

STEEL BUILDINGS

25'x90', 40'x40', 42'x56', 42'x135'

GAS COMPRESSORS

I.R. Type ER, 7x20, 14x20, 14&7x20

PUMPS

5"x12" Hot Oil, Worth. Duplex w/120 HP Diesel Engine.
NEW National Transit Steam, 6"x8"x18", 8"x5"x12", 10"x6"x12", 5½"x3¾"x8".

TANKS

12,500 bbl. welded 48'x39'.
1,500 bbl. bolted, vert. (2).
500 bbl. bolted, vert. low type (8)
12,000 gal. 8'x30' hor., rivet. (11).
10,000 gal. 8'x28' hor., welded (3).

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THREE USED RIGS — WEST TEXAS-TYPE

Rig A—Located near Lovington, New Mexico.
National 100 Drawworks, 3—6G-500 Superior Engines, National 7¾" x 18" and Gardner-Denver 7¼" x 14" Pumps, 136' Lee C. Moore Mast on 8' Substructure, 10⅝" Shaffer Double Cellar Control Gate, 13,500' 4" OD Grade E Drill Pipe and 25 Drill Collars.

Rig B—Located near Andrews, Texas.
National 75 Drawworks, 2—L-3000 LeRoi Engines, National C-250 Pump with National C-150 Standby powered by Waukesha NKU Engine, 133' Lee C. Moore Mast on 9' Substructure, 13⅝" Shaffer Double Cellar Control Gate, 13,500' 3½" Grade E Drill Pipe and 22 Drill Collars.

Rig C—Located near Andrews, Texas.
Unit Rig U-15 Drawworks, 3—Waukesha NKU Engines, National C-250 Pump, 127' Lee C. Moore Mast on 7' Substructure, 10¾" Shaffer Double Cellar Control Gate, 5,700' 3½" Grade E Drill Pipe and 36 Drill Collars.

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Distributors for CF&I — Lone Star — Pittsburgh — Wheeling
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FOR SALE

IMMEDIATE DELIVERY
OIL COUNTRY GOODS

35,000'	5½" OD 13#	E.W. RANGE 2	8 RD. THRD.
18,000'	5½" OD 14#	SMLS. RANGE 2	8 RD. THRD.
12,000'	5½" OD 17#	SMLS. RANGE 3	8 RD. THRD.
50,000'	6⅝" OD 18#	E.W. RANGE 3	8 RD. THRD.
25,000'	7" OD 20-23-26#	SMLS. RANGE 2-3	8 RD. THRD.
1,500'	9⅝" OD 32-30#	SMLS. RANGE 2	8 RD. THRD.
8,000'	9⅝" OD 40#	RANGE 2-3	8 RD. THRD.
60,000'	2⅜" OD EUE TUBING	E.W. RANGE 2	8 RD. THRD.
30,000'	2⅜" OD EUE TUBING	SMLS. RANGE 2	8 RD. THRD.
25,000'	2⅞" OD EUE TUBING	SMLS. RANGE 2	8 RD. THRD.

Other items line pipe, casing and tubing available, contact.

A. J. Strubel, 4946 Murdoch, St. Louis, Missouri,

Office—PRospect 2-2100, Residence—FLanders 1-8152

CLIMAX MOLYBDENUM COMPANY
Climax-Brundred Waterflood Division
P. O. Box 549
NOWATA, OKLAHOMA

A complete gas system, serving company properties located southeast of Nowata, Oklahoma, in Nowata County and extending into Rogers County, is ready to be abandoned. Sealed bids covering the following footages of secondhand pipe will be opened at 12 noon, September 1, 1956, at the above address.

Size	Type of Pipe	Footage
1.9" O.D.	Line Pipe T&C	3,935'
2⅜" O.D.	Line Pipe T&C	47,098'
2⅞" O.D.	Line Pipe PE & T&C	8,872'
3½" O.D.	Line Pipe PE & T&C	7,108'
4" O.D.	Boiler Flues PE	48,803'
5" O.D.	Boiler Flues PE	2,783'
5⅝" O.D.	Boiler Flues PE	23,152'
5½" O.D.	Casing PE	2,441'
6" O.D.	Principally Boiler Flues PE	27,341'
6⅝" O.D.	(6¼" Casing) PE	43,299'
7" O.D.	(6⅝" Casing) PE	4,989'

All footages have been measured and are believed to be accurate. Very little pipe is buried.

A single bid covering the entire system will be accepted only on a where-is, as-is, basis and will be sold to the highest bidder. However, the company reserves the right to reject any and all bids. Financial responsibility will be taken into consideration and terms can be arranged. Successful bidder will be notified on or before September 10, 1956.

Pipe may be inspected at any time by contacting

M. L. Hagan, General Superintendent,

at Nowata Camp Site, telephone—Nowata Oklahoma 202

SMALL MACHINE and Welding Shop with portable equipment all in good condition. Gale Kelly, Cement, Oklahoma.

93,000 FEET 4½" O.D. New Seamless Pipe weight 15.20 per foot 1035 steel High Pressure located Sherman, Texas. Price reasonable. Lun-Dow Company, Box 1215, Tulsa, Phone LU 5-8850.

2 GMC MODEL #12103 Twin Six Diesel Engines, excellent condition—one with 11,000 series torque converter. See at Carter Engine and Equipment Co. or call Dixon Drilling Company, 4-8503, Abilene, Texas.

TYPE E1 GUIBERSON rotating pack-off head w/rubbers and casing adapter. Used for air drilling. A-1 condition. $700.00 Contact R. F. Meeker, GI 7-9483, Tulsa, Oklahoma.

FOR SALE—Fairbanks Morse Alternating Generator, KVA 40, RPM 1200, ph. 3, Cy 60, Volt 240, complete control board, all excellent condition, $275.00. W. Caplis, Box 1312, Shreveport, Louisiana.

FOR SALE: Six 7⅛"x30' Drill Collars. Meridian Drilling Co., Inc., 931 City National Building, Oklahoma City 2, Okla. Telephone CEntral 2-2000.

FOR SALE EQUIPMENT

BROWN EIGHT DAY temperature-humidity chart recorder. Used less than 30 days. $150.00 f.o.b. Houston. E. D. Williams, 3114 Prescott St., Houston 25, Texas.

HELP WANTED

RESEARCH ENGINEER

B.S. or M.S. in chemical or petroleum engineering, for research in methods of evaluation of petroleum reservoirs and research and methods of increasing production from petroleum reservoirs. Some experience desired but not essential. Salary commensurate with experience.

An excellent opportunity for association with the Research and Development Division of a Major Oil Company. Liberal benefits. Midwest location. Excellent research and residential environment.

All replies confidential. Send complete resume to Box J-672, The Oil and Gas Journal, Tulsa, Oklahoma.

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GOOD OPORTUNITY with company newly active in foreign work—MUD ENGINEER Age 25-35. Top ability petroleum engineer with three years Gulf Coast experience with drilling mud problems and general oil field operation. Salary $12,000 tax free, plus living expenses. Box J-677, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2005, Tulsa, Okla. $5.00 cash.

Wellsite and Subsurface

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For small independent oil company operating in Ecuador, South America. Require 2 to 4 years experience. Excellent living conditions. Send full particulars on education and experience with references to:

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Major Oil Company has openings for Chemical, Mechanical, Electrical and Civil Engineers in several phases of refinery engineering and process engineering. Locations near New Orleans and south Arkansas, in booming industrial areas where climate and natural advantages make living more enjoyable for all the family. Attractive salary and benefits program. In reply give age, education, experience and salary expected. Pan-Am Southern Corporation, P. O. Box 2, New Orleans 6, Louisiana.

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Experienced graduate engineers for immediate openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

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With degree in Physical Chemistry or Chemical Engineering plus 5 years' petroleum production engineering experience which should include 2 years' study of reservoir fluid behavior.

Salaries commensurate with training and experience. Write outlining personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 116

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NEW YORK 22, N. Y.

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To assist in supervising office & field and domestic & foreign activities of the Operating Department.

Challenging opportunity for graduate chemical or mechanical engineer with minimum five years petroleum refining experience, preferably with contracting engineering firm.

Please airmail confidential verifiable chronological resume, including salary history, to

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HELP WANTED

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Will make various engineering studies as—drilling equipment, procedures, drilling mud, etc. Also time and efficiency studies.

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PETROLEUM ENGINEERS

(Ages 25 - 38)

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Write outlining personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR, BOX 182

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HELP WANTED

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GAS PIPELINE ENGINEER—Graduate, qualified for registration or registered. Mechanical, Civil, or Petroleum background. Immediate opening, experienced in construction, pipeline and compressor station design, and in pipeline economics and operations. Salary commensurate with experience and qualifications. Send resume with application. Chief Engineer, Mississippi River Fuel Corp., 407 N. 8th St., St. Louis 1, Mo.

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PETROLEUM EXPLORATION GEOLOGIST: desires responsible position with medium sized, independent, or integrated oil company. Eight years of diversified exploration experience in West Texas - New Mexico Area with major. Capable of evaluating and working up all types of geological prospects and trend plays. Thoroughly experienced in contouring regional and field maps. Box J-671, The Oil and Gas Journal, Tulsa, Oklahoma.

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No. 2 HARRIS LEASE: S/2 NW NE NW Dec. 24 T 24 R 12E Greenwood County, 3 mi. W, 1 mi. S, 1 mi. W, 1 mi. S, Virgil, Kansas. Mississippi lime well approx. 1715' daily prod. approx. 3½ bbls. On pipeline, electrically equipped.

No. 3 ANNA BOYER LEASE: NEc NE/4 Sec. 34 T25 R10 Greenwood County, 1 block E of tracks in Eureka, Kansas, on US54 and 6 blocks N on Cecil Jones place. Mississippi lime well, 1900'. Approx. prod. 5 bbls. daily. On pickup oil line, electrically equipped.

No. 4 LODGE LEASE: Block 5, Highland Park Addition to City of Eureka, Kansas, 2 blocks E of tracks on US54 and 2 blocks N. 1910'. Daily prod. approx. 5 bbls. On pickup oil line, electrically equipped.

For further information write or call Lloyd K. Jones, Box 128, Emporia, Kansas, Phone 680; or Mr. John Day Darrah, Legal Bldg., Wichita, Kansas, Phone Amhurst 2-7469.

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WANTED

WANTED — Drilling and/or Production deals in Kansas and Oklahoma. Contact Fell & Wolfe Oil Co., Box 346, Tulsa.

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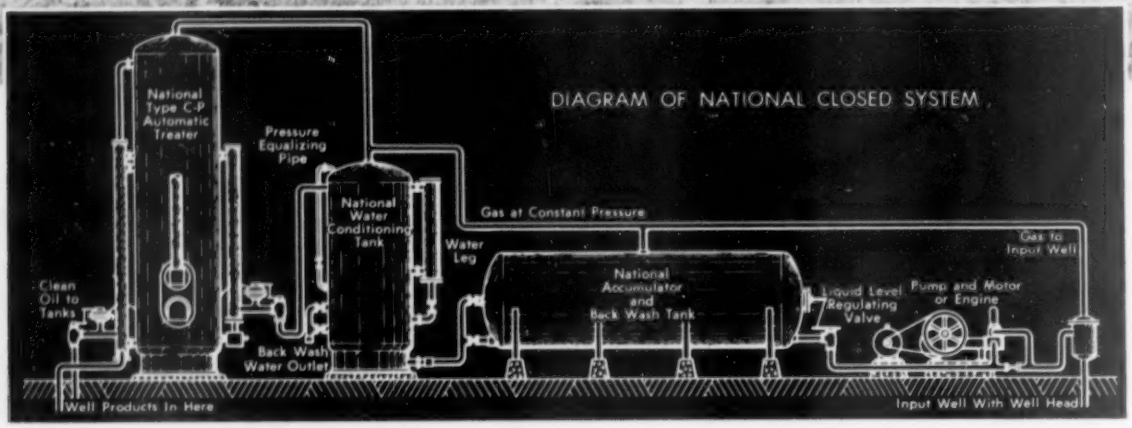
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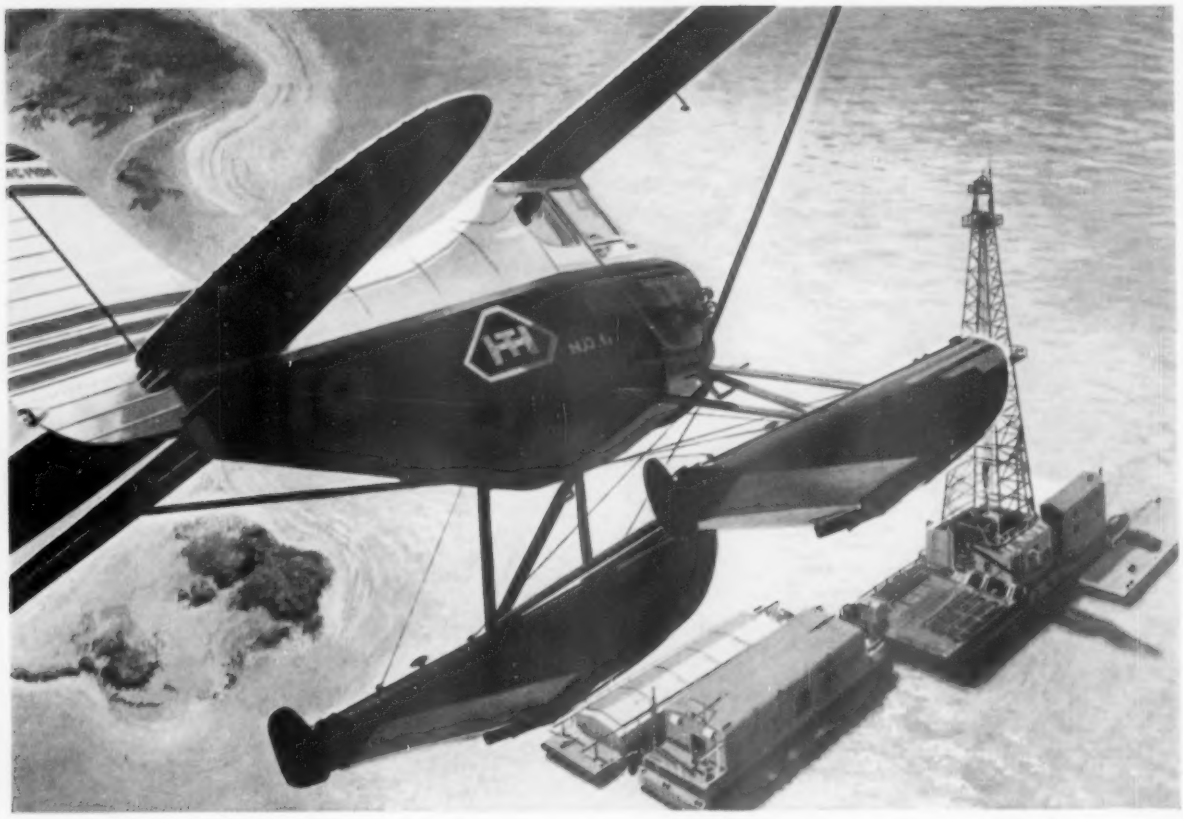

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